In This Issue: Interior Lighting of Theatre, Museum, Department Store and Home

JOURNAL OF ELECTRICITY

VOL. 40 NO. 5 SAN FRANCISCO, MARCH 1, 1918 PER COPY, 25 CENTS

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DOWN by the mighty Monterey cypress overlooking the vast Pacific, there is going to be a convention of historic value April 24-27, 1918. The halls and committee rooms of the classic Del Monte Hotel are even now being set in order, papers are being prepared in many sections, and earnest men and women throughout the West are looking forward to the holding of this War Service Convention of the Pacific Coast Section, N. E. L. A. that will go down in tradition as a gathering in full keeping with the spirit of the times.

The discussions will be extremely helpful and will serve to draw electrical men into closer, more effective working relationship at a time when never before existed a greater need for co-operative helpfulness.

You can't afford to miss this one great expressive convention of the year where jobber, contractor-dealer and central station man will meet. Watch for additional particulars in succeeding issues of the Journal of Electricity.

TENTATIVE PROGRAM

April 23—
10:00 p. m.—Special train leaves Los Angeles.

April 24—
8:00 a. m.—Special Train leaves San Francisco.
2:30 p. m.—Convention Called to Order—General Session.
8:30 p. m.—Convention—Social Session.

April 25—
9:00 a. m.—Engineering — War Session.
5:00 p. m.—End of Engineering War Session.
8:30 p. m.—War Service Ideals for Electrical Industry.

April 26—
9:00 a. m. — Commercial Section — War Session.
4:00 p. m.—End of Commercial Section—War Session.
4:00 p. m.—General Session — Election of Officers.
5:30 p. m.—Close of Formal Convention.
7:00 p. m.—Grand War Service Banquet.

April 27—
9:00 a. m.—Field Sports and Outings
1:00 p. m.—Seventeen-mile Drive and Marine Outing.
6:30 p. m.—Abalone Dinner at the Highlands.

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

VOLUME 40 — SAN FRANCISCO, MARCH 1, 1918 — NUMBER 5

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How the Upbuilding of the West is Helping to Win the War—VIII

THIS huge, expressive sentinel—the Campanile on the campus of the University of California, hovering over massive academic structures, enshrouded in the eucalyptus and palm growth below—is symbolic of that splendid spirit of the West that is today going forth from academic halls throughout the commonwealths of the West to fight for the cause of democracy. Sixteen hundred undergraduates now enrolled in active service in the army and navy from a single university of the West!

"So you'll live, you'll live, young fellow, my lad,
In the gleam of the evening star,
In the wood-note wild and the laugh of the child,
In all sweet things that are.
And you'll never die, my wonderful boy,
While life is noble and true;
For all our beauty and hope and joy
We will owe to our lads like you."

— Robert Service

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

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WHAT IS NEEDED IN THE POWER SITUATION—

Thoughtful men who attempt to pierce the uncertain years ahead have much upon which to ponder, for in the solution of the grave problems that present themselves rests much for the future welfare and happiness of the human race.

So interwoven has become the method electrical with practically every phase of human existence that any solution of the more general problem must perforce affect the electrical industry and its future welfare.

While it is difficult to foretell to a full degree just what the outcome of utility life may be in the fuller development of the coming months, there are a few of the issues that can be foretold beyond the question of a doubt.

The first and foremost is that as long as human life prevails the uses of electrical energy will expand and enlarge, and more and more will the affairs of human endeavor be concerned with the efficient development of this type of energy in all its various applications. In view of this fact, then, that central station man or power plant manager who in these strenuous times retrenches in utility expenditure to the point where efficiency is impaired or permanency of service endangered, is not worthy of the high trust reposed in his hands.

The one great thing that it needed in this hour of emergency is the continued efficient development of the hydro-electric resources of the nation. This is not a day of retrenchment. The basis upon which hydro-electric investments have been made is sound and secure. The task ahead is one of education and development.

Let those who have put their years of effort in the development of the hydro-electric resources of the West take heart, for, where the fundamental law is sound and secure, the superstructure of doubt and fear falls powerless before effective education.

Concerted effort should be taken with a broader objective by all interested in the best interests of the electrical industry, to show to the public at large the secure basis upon which such development rests. And in this educational effort no political intrigue is to be tolerated to bring about the desired results necessary for Congress to open up reservoir and power sites upon the national domain. The campaign should be waged agreeable to clause one of President Wilson's fourteen points necessary to establish international peace—namely, that all negotiations be made in the open.

Broaden out the scope of activity that has been taken in such effort as that now under way in California. Make the problem not one of co-operative merchandising alone. If necessary employ the biggest man that money can buy to effectively aid in this inter-co-operative movement among all branches of the industry and—then—go a step further. Collect such effective data that Congress and the public at large must be convinced of the necessity of further developing water power in the West, in order to properly handle the situation in the East that is absorbing the life blood of the nation.

By the efficient and timely development of the hydro-electric resources of the nation, and the consequent establishing of much needed industrial activities near the scenes of this possible power, can the impending shortage and ultimate exhaustion of coal and crude petroleum be averted.

Let the men of the electrical industry in the West pay heed to this crying need of the hour — full and above-board education — and not only will retrenchment not be found necessary, but an enlightened public sentiment, fully appreciative of the continued sincere and efficient effort of an industry now without a peer in the industrial traditions of the nation, will itself demand that Congress grant all reasonable permits for extending hydro-electric development, and there will result an abundance of private capital willing to further invest in securities of this nature.

Your Bottom Drawer

Labor is after all the greatest need of the moment. Not only must workmen be found to meet emergencies and shifted from non-essential to essential fields, but we must get more concentrated service from the workmen which we have. This applies not alone to the man who is working for wages, but also to the man at the head, even to the owner.

A modern efficiency engineer accused the man of big business, not long ago, of wanting his employees to be efficient in order that he might play golf. There is something in the accusation that the greatest loss to a concern is in the wasted time which its workers spend in thoughts devoted to other interests. "Look and see what they keep in the bottom drawer," advises one educational director. This is a time when the nation must do double and triple service with the same force of workers.

Industry cannot afford to grant the laboring man too short hours, the head of the concern cannot be allowed to retire before his time. Greater efficiency is needed in every walk of life. What do you keep in your bottom drawer?

Electrifying The Electrical Fixture

With the advances in the theory of lighting of the last few years, we are really entering today for the first time upon the full advantages in illumination of our electrical age. In hardly another field have changes been more radical or have they affected more the life of the individual than in the field of lighting. The advent of each new illuminating medium has widened immeasurably the sphere of application and has revolutionized the theories of the art. Electricity in particular has completely changed the aspect of almost every phase of life. The feature articles of this issue, which cover the fields of theater, store, museum and home lighting, give some conception of the innovations electricity is making possible.

It is interesting to note that the role of indirect lighting is prominent in each case. This is distinctly an electrical development, in a way an outgrowth of the necessity for shading the electric lamp completely from the eye. The eyestrain records kept by a large Western concern indicate that even semi-indirect lighting is hard upon the eyes when used for extended periods, a trouble which has been done away with in the adoption of an indirect fixture.

Perhaps the two most outstanding features of the electric lamp in illuminating practice are that, in the first place, it cannot be looked upon with comfort, and in the second, its light is non-inflammable, and therefore may be placed in any position, at an angle, or even inverted.

This gives a possibility of great freedom in the design of fixtures for all purposes, a freedom which up to recently has been but little appreciated. The early electric fixtures were mere adaptations of the gas jets and chandeliers which went before them, as these in turn had imitated the candle and the torch. The new fixtures and the new theories of lighting mark the full acceptance of the electrical idea. This is a new medium of light with which to work—and in the recent installations expressing conceptions of architects and electrical men, is a dawning realization of the possibilities in the use of electricity. Unquestionably the perfect fixture has not yet been achieved. The field is one as yet unexplored to its depths—and offers much of interest to the illuminating engineer of the future.

Nevertheless, the beautiful and effective recent installations in interior lighting described on other pages of this issue show the splendid progress that is being made in the West looking toward adapting the method electrical to every branch of service in the modern building interior.

Hydro-Electric Power and the Weather

The situation which has been confronting the hydro-electric power plants in those regions of the West affected by this winter's dry spell has been greatly improved by the recent rains. The weather of this winter seems to have provided something "the most unusual" for every part of the country—and in the central and southern Pacific Coast region it was, up to February, absolutely the dryest season on record. Reports from the Northwest and Intermountain districts seem to indicate a normal rainfall—but in the mountain regions of California snow was only two inches deep at a period of the year when it usually averages 90 to 100 inches. During the last two weeks some 60 to 70 inches of snow have fallen, but the precipitation is still far below normal. This late snow never packs well and does not give the full amount of water per foot, nor does it last far into the summer season. For the farmer and the man who is not provided with adequate storage facilities the situation is a very serious one, even with prospects of a very wet spring. For the usual power project of the West, however, with its huge reservoirs which conserve the water, whether its precipitation be concentrated into a few weeks or spread throughout the year, the future looks considerably brighter. Plants which looked forward to shutting down completely during the last of the summer, or running at half capacity, will probably reach almost normal, depending on the wetness of the spring. The threatened failure of the hydro-electric power supply was particularly serious just now, with the already excessive drain on oil, and with Congress considering water power bills and ready to be affected by any untoward report. In the case of the weather, however, the worm always seems to turn—and the round of the year's season usually averages up relatively well. Occasionally there is a rumor of the climate having changed, but like the report of rain failure due to the cutting of the forests, which was generally accepted a decade ago in this same part of the West after eleven excessively dry years, it is usually followed by a flood.

Hydro-electric power development in a sense is dependent upon the weather, but the adequate provision of storage facilities upon which such vast sums of money have already been spent and for which further sums are ready, seems to provide an edequate answer to the situation. Nature may be depended upon to do her share eventually, if not at a given date. Such projects as are already serving the West, and others which may be developed under encouragement, represent pure gain to the nation. Not only do they mean so many million barrels of oil saved outright, but in seasons such as the present the existence of these great reservoirs means salvation for the farmer who uses the same water below and who now can count on a steady supply long after other sources have gone dry.

The Value of the Letter of Credit

While the daily commerce reports indicate an ever-increasing commercial and engineering growth with Pacific neighbors in the Orient, casual observation brings to light the fact that engineers and other men of the electrical industry in the West are more and more viewing with increasing interest a possibility of getting more personally acquainted with these countries by taking vacation outings in transpacific voyages.

It is well, in view of this fact, that a closer attention be paid to familiarizing oneself with means of conveying upon one's person the proper credentials to convert into cash the funds necessary for expenditures while making such tours.

In visiting any of the Far Eastern countries, the traveler will find that the American gold dollar is revered and respected everywhere. Unless one expects to make an unusually long stay in a particular country, it is best to keep one's money in the American units.

To this end one should by all means travel with little actual coinage about his person or in his possession. All recent travelers report that the American Bankers' Association notes are of inestimable service in that part of the world. These notes are accepted in the heart of Japan by merchant, hotel clerk, or banker with equal alacrity, while in the Philippine Islands or the interior of China the same courtesy is always extended.

In case of theft or loss they will be redeemed by the home banks, and this is no little guarantee in Oriental traveling. An American engineer recently was robbed in Yokohama, and reports with grateful thanks that he had but one yen twenty in his purse — sixty cents. His remaining money was securely represented in A. B. A. bank notes absolutely protected and safe in value to him. For the small price of 50 cents per one hundred dollars, these notes may be secured from any American banker before one's departure abroad. At the time of issuing, the local cashier signs each note to identify the purchaser's signature, which the purchaser writes in the presence of the banker. When the purchaser desires to use these notes in a foreign country, he signs again in a place provided, and the signature makes available at once the face value of the note. Without this signature, however, the note is valueless and the American Bankers' Association protects the purchaser against forgery.

In passing it is interesting to call attention to one small feature of Chinese money which it will be well to remember. For each one dollar that you may desire to get changed into twenty-cent pieces, you are given six coins of the latter denomination, or one dollar twenty cents. When straying about in a Chinese port, it is well to remember this fact and fill your pockets with these smaller coins before starting to pay rickshaw men, Sedan chairmen, or to make small purchases. You will find, however, that the merchant protects himself from too freely accepting the smaller denominations by accepting them for purchases of less than two dollars in value, above which figure the larger denominations must be used.

It has already been mentioned that the A. B. A. checks are readily accepted on all sides for their equivalent in Oriental values. One must, however, at all times have sufficient in small amounts to meet little expenses of daily occurrence. These local moneys may be purchased at regular exchange banks for a moderate cost. Beware of many of the street money changers unless you are posted on the rates of exchange. Usually the purser on the ship upon which you are traveling will give you ample money in exchange for your American gold without charging you a cent. This is done as a matter of courtesy and accommodation to the ship's passengers.

Better Salesmanship

The highest salesmanship consists in making a buyer understand the true merits of the article you are seeking to sell. No less an authority than Charles M. Schwab, chairman of the Board of the Bethlehem Steel Corporation, has stated that the supersalesman is one true to the interests of the customer, and whose supreme purpose is to quicken the imagination of the customer and thus make the customer see the true virtues of the goods the salesman is selling.

The great diversity of new electric appliances for the home that is noted on all sides calls each day for a higher class of salesmanship. One of the greatest elements of skill in a salesman is to create in the mind of the customer the thought that the salesman will in fact be able to produce the goods which he is trying to sell. The samples may be fine, but the customer must know that the man in the factory behind the samples will also do his part to the uttermost.

It is important that the central station merchandising department as well as the contractor-dealer realize to the fullest extent these forceful and necessary ideals in salesmanship. To attain these ideals requires constant thought and study. The beginning of a series of articles found on another page of this issue, under the authorship of Miss Elma Steinmann, is a helpful advent in the West looking toward better and more effective salesmanship. Miss Steinmann, as the head of the educational department of a sales organization in one of the great department stores of the West, sets forth a convincing and forceful treatment of proper methods of approach, store window decoration, advertising and other essentials of producing effective results in the merchandising of electrical ware.

NEW JOURNAL SERVICE: The new problems that have arisen due to the interconnection of transmission lines of the West make a review of the present status of high tension transmission service in the West of great timely interest. The feature of the issue of the Journal of Electricity for March 15, 1918, will be a discussion of some of these problems. The hydraulic units for the giant Big Creek plant of the Southern California Edison Company, which have set a new world's record for this character of service, will be described in detail. In this same issue will also be described the remarkable new line that is being built by this company to connect with the San Diego Consolidated Gas & Electric Company, which involves converting the alternating current from 50 cycle to 60 cycle energy, in addition to many interesting new features of construction work. Phases of interconnection experienced in other territories will also be treated in a manner that will prove interesting and helpful.

INNOVATIONS IN THEATRE ILLUMINATING

(It is interesting to note in how many phases of a motion picture theater's business electricity plays a part. From the flood lighted exterior to the electrically heated organ chambers, to the special electrical equipment of the operating room, this theater has made use of the latest devices in every branch of electricity. Added to this the unusual beauty of fixtures and stage effects makes this theater one worthy of detailed study from the electrical standpoint.—The Editor.)

THE LOBBY
There is great variety shown in the electrical fixtures — but all are attractive.

FROM the motion picture equipment itself to the aisle lights and the telephone systems, the latest in electrical devices has been sought out to make the California Theater of San Francisco a thing of beauty and of comfort for its patrons.

The building itself is of reinforced concrete in the gothic style with main auditorium, vestibules, lounge room, rest rooms, try-out rooms, offices and store rooms. Both within and without (for the theater is flood lighted), its main feature of attractiveness lies in the artistic lighting scheme.

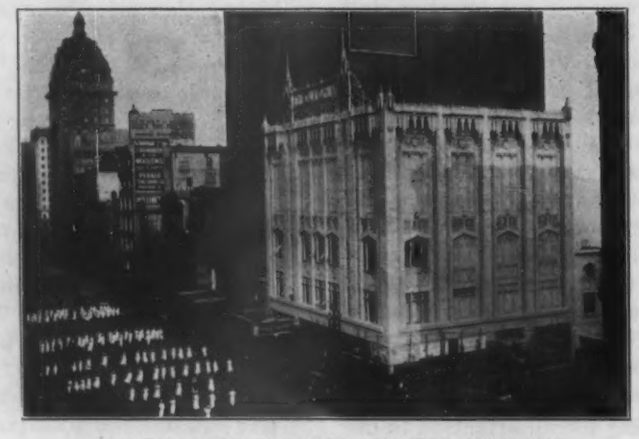
The stage is framed in a fan-like sounding board of metallic finished filigree work which provides space for the organ pipes, as well as offers an effective reflecting surface for the stage illumination. The color effects are particularly good and the changes of light with the gradual brightening of the blue back-curtain in peacock design, in contrast to the side hangings of old gold, provides a picture of rare beauty.

The auditorium lighting is semi-indirect and is arranged so that a dim light is provided even during the exhibition of pictures, and then brightened during organ solos and intermissions. Aisle lights alongside each row, and exit lights provide effective illumination underfoot and for emergencies.

The organ itself is electrically driven with an ingenious arrangement by which it sinks down out of sight while the film is running and then rises to within view of the balcony as it is being played.

A lounge room of considerable size is provided for the convenience of patrons, which is effectively illuminated by central fixtures, side brackets and portables. An illuminated fountain forms an interesting feature here.

Telephones are provided on this floor for the free use of the public, and a house system connects offices, ticket booths, stage and organ rooms.



THE THEATER IS FLOOD LIGHTED AT NIGHT
A night scene would appear not so different from the one shown here except that the theater announcements and the electric sign on the roof would stand out. Projectors are located on the roof of the marquise.

The details of electrical equipment are most complete. Beginning at the service switchboard, we find a duplicate set of services both for A. C. and D. C., with necessary single throw switches on each current for the general lighting and power, and an automatic throw over switch on the exit and emergency feeds.

From this point connection is made to sub-distributing panels in the basement directly below the stage switchboard, to the stage board and panels in the lobby controlling the exit and emergency lighting, general lighting throughout the lounging room, exterior lighting and motors on roof, to panels in the operating room, to the try-out room, to each motor in basement, stage and attic, and to each heating unit in each of the organ chambers.

The panels in the operating room are fed from each A. C. and D. C. service and double throw switches provided for each machine, dissolvers, spot-light and motors. Weston ammeter and volt meters for arc and primary voltages are provided on the panels with necessary switches for taking the reading on any machine off either service. Rheostats are placed in a special chamber under the room, this chamber as well as the operating room being ventilated by forced draft created by fans placed on roof. Equipment is complete with the Motiograph projecting machine, spot-light, dissolvers and winding and rewinding apparatus. All panels are provided with sliding doors.

The try-out room is located in basement, fully equipped with projecting machines and all necessary apparatus.

The stage equipment is complete with three sets of borders, side and foot lights, each containing lamps of four colors, viz: white, red, blue and amber, seven three-gang incandescent pockets, seven D. C. arc pockets in the stage floor, four D. C. arc pockets in spot and fly galleries, and two flood lights on the balcony front. General Electric Company dimmers are provided for each color in each border, side and foot light, and two of the three-gang incandescent pockets. These dimmers are provided with individual and master levers. All circuits are controlled by knife switches on the stage board, master control by push-button switches here operating contactors on the board in the basement.

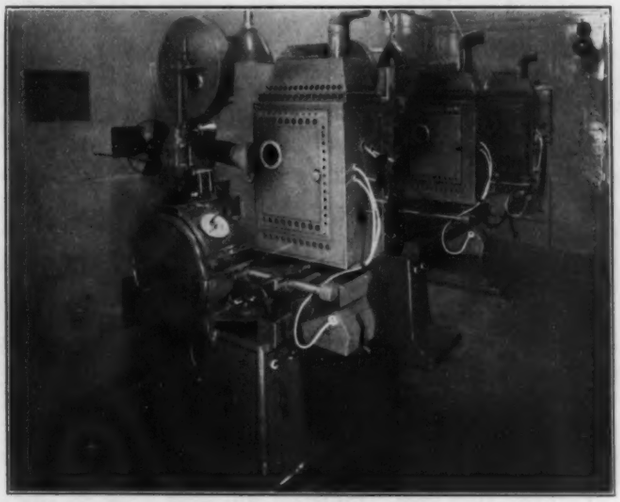
The auditorium lighting is semi-indirect and is also wired in four sections to each outlet for as many

colors, viz: white, red, blue and amber. These lamps are fed through four sets of motor-driven dimmers, including a duplicate set of dimmers for footlights. These footlight circuits are provided with double throw switches on the stage board so that they may be fed through the auditorium or stage set of dimmers as

THE LOUNGING ROOM
A system of direct and semi-indirect lighting gives a pleasant and restful effect.

desired. All of this lighting and the motors are controlled by three sets of push buttons in the operating room and on the stage board, operating contactors placed on the board in basement.

Exit and emergency lighting consists of aisle lights placed in the floor of the auditorium and attached to the rails or set in the walls of balcony aisles,



OPERATING ROOM
The latest electrical equipment is used throughout

in addition to the regulation lighting required under the ordinance in corridors, lavatories and exits. The lighting of the main vestibule is a combination of semi-indirect and indirect lighting, as is also that of the lobby and lounging room.

The exterior lighting of the theater consists of three projectors on the marquise on Fourth street and five on the marquise on Market street, of 1000 watts each, which are placed so as effectively to bring out the face of the building. In addition to this, there are 1000 lamps in the two marquise and 700 lamps in the sign, which is placed on the roof, displaying seven different designs.

The organ chambers are electrically heated, each heater being automatically controlled by thermostats set to keep a uniform temperature both day and night.

The power service consists of motor-driven apparatus for the ventilating system, organs, ejector, vacuum, sprinkler, water supply, lift for the console and curtain. All motors are provided with "Safety First" equipment. The lift for the console is operated by a push button on the console and is equipped with limit switches and an electric brake on the motor. The

THE AUDITORIUM LIGHTING
Note the aisle lights as well as the beauty of the semi-indirect fixtures. The use of color in both stage and general lighting is extremely effective.

curtain is operated by eight push buttons (five on the stage and three in operating room) which permit of its being raised, lowered and stopped at any point.

A call and signal system is provided which consists of signal lamps placed at points throughout the auditorium and lobby, which may be operated from a switch in ticket booth. A full automatic non-interfering Decker intercommunicating telephone system of eighteen stations connects all executive offices, ticket booth, operator's room, stage, etc. Five of these stations are equipped with the Decker loud-speaking receivers, which permit the party called to carry on a conversation without the necessity of having to remove the receiver from the phone. A Couch system of phones between the six organ chambers and the console permits of conversation between any chamber and the console.

GROUND CONNECTIONS FOR DISTRIBUTION SYSTEMS

BY W. C. HESTON

(The great cost of the prescribed ground for overhead distributing systems, led a Portland company to experiment with various types of ground to see whether a more inexpensive method might not be found which would meet requirements. The results of these comprehensive tests and the conclusions drawn from them are here presented by the assistant superintendent of the department of wires and conduits of the Portland Railway, Light & Power Company.—The Editor.)

Following the publishing and placing into effect of the Public Service Commission's regulations governing overhead line construction, which provided that the neutral point or wire of all transformer secondaries strung or erected for use in low potential distributing systems, where the normal maximum difference of potential between the ground and any point in the secondary circuit, when grounded, would not exceed 150 volts, the Portland Railway, Light and Power Company, due to the high cost of complying with the specifications calling for the installation of a 1/16 inch copper plate, having an area of not less than 3 feet by 6 feet buried in coke below the permanent moisture level, and a desire to investigate the relative merits of such a plate ground, and galvanived iron pipes driven to various depths, conducted a series of tests on the relative effectiveness of these different types of grounds, as outlined and described herein.

Tests were first conducted on a ¾-inch galvanized iron pipe driven into the ground to a depth of 6 feet.

In order to carry out this test a tap was made to a 600 volt railway feeder and connected to the ground pipe with an ammeter in circuit and a voltmeter across the line.

Simultaneous readings of the instruments were taken at intervals of one minute. These readings with the corresponding resistances are as follows:

Time—	Current	Voltage	Resistance
Start	7 amperes	600 volts	85.7 ohms
1 minute	5 "	600 "	120 "
2 minutes	4 "	600 "	150 "
3 minutes	3.75 "	600 "	160 "
4 minutes	3 "	600 "	200 "
5 minutes	2.9 "	600 "	206.3 "
6 minutes	2.8 "	600 "	214.7 "
8 minutes	2.5 "	600 "	240 "

It will be seen from these tests that the initial resistance of the ground element was quite high and that it increased very rapidly after the first application of current due to the drying out of the earth around the pipe.

The soil in the district where this pipe was driven is comparatively free from gravel and rocks, and as the weather had been rainy for a week prior to this test, this type of ground was tested under favorable conditions.

However, attention is called to the fact that, due to the method of making this test, the resistance of the ground pipe alone was not obtained; the resistance given above being that of the ground pipe and the street car rails in series. It is impossible under the circumstances to say what the resistance from the rails to the earth is, and for this reason it is also impossible to say what the resistance from the pipe to the earth is. It is probably safe to assume that the resistance of the pipe is more than half of the resistance of the two in series.

Another test to determine the resistance of this same type of ground was made by a method to be mentioned later, which gave the resistance of the pipe alone. The results of this test indicated a resistance of 30.4 ohms, which is probably about the resistance this type of ground would be found to have in most all parts of the city. The soil in this case was similar in all appearances to that of first test. The worst feature of this type of ground is the rapid drying out of the earth around the pipe when a current is flowing.

In order to determine the effectiveness of a ground connection made in accordance with the Commission's specifications, a tinned copper plate 3 feet by 6 feet, having a total area of 36 square feet, was placed in the ground in a horizontal plane at a depth of 6 feet, and a layer of coke 3 inches in thickness placed on each side of it.

A test was then made by making a tap to a 600 volt railway feeder and connecting to the plate with an ammeter in the circuit and a voltmeter across the line.

Following are the simultaneous readings taken on the instruments and the resistance corresponding to these readings:

Time—	Current	Voltage	Resistance
Start	41 amperes	600 volts	14.65 ohms
1 minute	39.5 "	595 "	15.1 "
2 minutes ...	38.5 "	575 "	14.95 "
3 minutes ...	39.5 "	595 "	15.1 "
4 minutes ...	38.25 "	545 "	14.25 "
5 minutes ...	38 "	548 "	14.35 "
10 minutes ...	37.5 "	570 "	15.2 "
15 minutes ...	38 "	575 "	15.15 "
20 minutes ...	37.5 "	525 "	14 "
25 minutes ...	38 "	575 "	15.15 "
30 minutes ...	38 "	565 "	14.9 "

The fluctuations in resistance are largely due to the impossibility of reading the instruments simultaneously. The resistance apparently dropped from 15.1 ohms at the start to 14.9 ohms at the finish, maintaining almost a constant resistance throughout the time the current was applied.

This test was made the day after the plate was installed. At the time it was installed a quantity of 30 gallons of water was poured into the hole so that this test was made under favorable conditions. In this case, as in the case of the first pipe mentioned, the resistance of the ground plate and the street car rails in series was obtained rather than the resistance of the ground plate alone.

This plate was installed in the spring of 1915, and on August 31, 1915, tests were made to determine if there was any appreciable increase in resistance due to the ground drying out during the summer season, and also to see if the ground around the plate would dry out due to the flow of a current from the plate into the earth for a short period of time.

The resistance decreased about 2 ohms between the time the plate was installed and the time this test was made, notwithstanding the fact that the weather was dry the greater part of this period.

On October 3, 1916, a little over a year later, current was again applied to this plate and a current of 65 amperes at 592 volts was found to flow. The resistance corresponding to this current and voltage is 9.1 ohms which is about 6 ohms less than when first tested, and about 4 ohms less than when tested the second time.

There is little doubt as to the permanence and effectiveness of this type of ground connection, or of its being able to meet all requirements. The high cost of installing a ground of this type, however, makes its use prohibitive except in special cases. The cost of installation was $41.00, and with the present prices of copper it would cost considerably more.

As the two types of grounds above mentioned seemed impractical, it was decided to experiment with the so-called "treated" ground, and with pipes driven to a considerable depth. Accordingly, a ¾-inch galvanized iron pipe was driven to a depth of 18 feet in a district where the soil is very gravelly.

At a depth of 9 feet current was applied to the pipe and a current of 3 amperes at 575 volts was found to flow. Current was applied at various depths, but did not increase above 3 amperes during the driving process. About 3½ pounds of rock salt was then placed around the pipe and thoroughly soaked into the ground with water. The addition of the salt and water brought the current up to 10 amperes, which seemed to be about the maximum which could be obtained.

The resistance of the ground element was 192 ohms before the salt and water were added, and 57.5 ohms afterwards. It is quite evident that permanent moisture was not reached at a depth of 18 feet and it is hard to say at what depth it would have been reached.

The soil at this point was evidently exceptionally gravelly and in order to confirm this belief and also to see if a satisfactory ground in this district could not be obtained without resorting to treating, another test was made about a thousand feet from the point where the first test was made.

The following tabulation shows the readings taken and the corresponding resistances at the various depths:

Depth of Pipe	Current	Voltage	Resistance
9 feet	2 amperes	238 volts	119 ohms
10 feet	2.05 "	234 "	114 "
11 feet	2 "	233 "	116.5 "
12 feet	2.1 "	234 "	111.5 "
13 feet	2.2 "	235 "	106.7 "
14 feet	2.3 "	236 "	103.5 "
15 feet	2.4 "	236 "	98.3 "
16 feet	2.2 "	236 "	106.8 "
17 feet	2.5 "	236 "	94.4 "
18 feet	2.5 "	236 "	94.4 "

No attempt was made to treat this ground. It will be seen that the resistance was only about half that of the first ground before it was treated, indicating that soil conditions in the first case were a little unusual.

A test was then made on a one inch galvanized iron pipe driven to a depth of 12 feet into the ground, in the Irvington district where a clay soil, free from rocks and gravel, is found.

This pipe had about 300 quarter inch holes drilled into it between points 3 feet from either end, making a sort of sieve; the theory being that if this pipe were to be filled with salt after it had been driven into the ground, and water poured into it to dissolve the salt, a salty solution would be carried out through the holes and saturate the surrounding earth, and after this had been done a few times, if the pipe were again filled with salt without the addition of water, the salt would very gradually dissolve and pass out through the holes and thus maintain a salty condition of the soil around the pipe for a considerable length of time.

It was found, however, that the salt dissolved very rapidly and apparently would remain in the pipe for such a short length of time after its installation that it was not worth the time and expense to drill the holes.

After the pipe had been driven to its full depth of 12 feet, current and voltage readings were taken in the manner described in the last test mentioned. A current of 7.5 amperes at 240 volts was found to flow, which gives a resistance of 32 ohms. About 5 pounds of salt was then placed in and around the pipe and a quantity of water added by means of a hose. The current was again tested and found to be 17.5 amperes at 240 volts, giving a resistance of 13.75 ohms.

It was believed that if a pipe was driven to a depth of 15 or 18 feet in this same vicinity, equally as low resistance could be obtained. Accordingly, a one inch pipe was driven to a depth of 18½ feet, at a point about 240 feet distant from the other pipe.

Current and voltage readings were taken at various depths; these readings and the corresponding resistances are as follows:

Depth	Current	Voltage	Resistance
9 feet	7.4 amperes	236 volts	31.9 ohms
10 feet	7.7 "	236 "	30.65 "
11 feet	8.6 "	236 "	27.45 "
12 feet	8.9 "	235 "	26.4 "
13 feet	9.25 "	234 "	25.3 "
14 feet	9.6 "	237 "	24.7 "
15 feet	10.4 "	236 "	22.7 "
16 feet	10.6 "	238 "	22.27 "
17 feet	10.8 "	238 "	22.05 "
18 feet	11.2 "	238 "	21.25 "
18.5 feet	11.4 "	239 "	20.95 "

Expectations were not quite fulfilled but the results of this test show that quite a satisfactory ground in soil of the nature encountered here can be obtained by driving a pipe to a depth of 18 feet.

At the time this test was made the resistance of the other ground was measured and found to be 12.2 ohms, showing a decrease of 1.55 ohms in a period of 8 days.

Inasmuch as the method of measuring the resistance of the pipes in these cases did not give the true resistance of the pipe alone, but instead the ground pipe and the water system in series, it was decided to employ a means of testing which would eliminate this error. This was done as follows: The ground connection from the water faucet was removed and one side of the 240 volt (ungrounded) secondary was connected to one pipe and the other side to the other pipe with an ammeter and voltmeter in the circuit. The resistance of the two pipes in series was found to be 32.4 ohms. As stated above, the resistance of the first pipe was 12.2 ohms, and the last one, 20.95 ohms.

Designating the first pipe as X, the second as Y, and the water pipe as Z, we have:

$$Y + X = 32.4$$

$$Z + X = 12.2 \quad \text{Subtracting}$$

$$Y - Z = 20.2$$

Then— $Y - Z = 20.2$
$Y + Z = 20.95$ Adding
$2Y = 41.15$
Or— $Y = 20.575$ ohms
Similarly $X = 11.825$ ohms and
$Z = .375$ ohms

This method, in addition to determining the resistance of either pipe alone, brings out an interesting feature: that is, the resistance of the water system to ground, which, as shown above, is .375 ohms.

Another of the "sieve type" ground pipes was installed on the west side of the river. This pipe was driven to a depth of 12 feet and tested in the manner just described. The resistance before the salt and water were added was 26.8 ohms.

This resistance was obtained as follows: A ½-inch temporary pipe was driven about 3 feet into the ground and 240 volts impressed across this and the ground pipe with an ammeter in circuit. The current which flowed at this voltage was 3.5 amperes, giving a resistance of 76 ohms. This test was repeated, using the temporary pipe and one of the 6-foot pipe ground connections which happened to be installed at the base of the pole. At a pressure of 239 volts, a current of 3 amperes flowed, giving a resistance of 79.6 ohms. In like manner with 240 volts across the main ground and the old ground, a current of 4.2 amperes flowed, giving a resistance of 57.2 ohms.

Designating the resistance of the main ground, the old ground and the temporary ground by A, B and C, respectively, we have:

$A + C = 76$
$B + C = 79.6$ Subtracting
$A - B = 3.6$

Then— $A - B = 3.6$
$A + B = 57.2$ Adding
$2A = 53.6$
$A = 26.8$ ohms

Similarly, the resistance of B was found to be 30.4 ohms, and C, 49.2 ohms.

About 5 pounds of salt was then placed in and around the pipe and a quantity of water added.

The above tests were repeated with the following results:

$A + C = 52.7$
$B + C = 68$ Subtracting
$A - B = 15.3$

Then— $A - B = 15.3$
$A + B = 22.7$ Adding
$2A = 7.4$
$A = 3.7$ ohms

Similarly, $B = 19$ ohms and $C = 49$ ohms

In order to check the resistance of the main ground determined in this way, one side of the 240 volt secondary was grounded to a water hydrant about 300 feet away and the other side was connected to the ground pipe with a voltmeter and ammeter in circuit. Nineteen amperes flowed at a pressure of 240 volts, indicating a resistance of 12.63 ohms.

The wide discrepancy between this resistance and the resistance of 3.7 ohms as obtained by the other method is undoubtedly due to the earth around the old ground becoming pretty well saturated with the salty solution due to the fact that it was only 18 inches distant from the main ground. If this were true, there should be quite a reduction in the resistance of the old ground, which it will be seen from the above is exactly the case, the resistance having decreased from 30.4 ohms to 19 ohms. It will be noted that the resistance of the temporary ground decreased only .2 of an ohm.

It will also be noted that the resistance of 26.8 ohms before the salt was added and 12.63 afterwards, check very closely with resistance of 32.4 ohms before and 12.2 ohms after the salt was added to the other sieve type ground.

In order to have more complete data on the effectiveness of pipes driven to a depth of about 18 feet, a test was made on a ¾-inch galvanized iron pipe driven to a depth of 19 feet, in the Sunnyside district, where the soil is similar to that found on the west side and in the Irvington district.

Beginning at a depth of 11 feet, current and voltage readings were taken at various depths by means of grounding one side of the 240 volt secondary to a nearby water faucet and connecting the other side of the line through the ammeter to the ground pipe, with the voltmeter across the line.

Depth of pipe, current and voltage readings, and the corresponding resistances are given below:

Depth of Pipe	Current	Voltage	Resistance
11 feet	14.6 amperes	236 volts	16.15 ohms
12 ft. 4 in..	15.7 "	235 "	15 "
13 feet	17 "	235 "	13.8 "
14 feet	17.8 "	234 "	13.15 "
15 feet	19 "	235 "	12.38 "
16 feet	19.8 "	234 "	11.8 "
17 feet	19.4 "	234 "	12 "
18 feet	19 "	234 "	12.3 "
18 ft. 6 in..	19.8 "	234 "	11.8 "
19 feet	20.5 "	234 "	11.40 "

At 19 feet the current was left on a little longer than at the other depths, and it was noticed that it began to gradually increase, and after a period of about 10 minutes it reached a value of 23 amperes. The current was left on for about 5 minutes after this and it fluctuated gradually between 21 and 23 amperes, averaging about 22.5 amperes. No explanation is offered for this phenomenon.

It is planned to test these various ground connections from time to time to determine what changes time and varying weather conditions will bring about.

However, due to the urgency of adopting a more effective type of ground than the one in use, it was felt that sufficient data had been gathered to justify the following conclusions:

Where soil conditions are in general the same as those prevailing where most of the above tests were made, that is, a clay soil free from rocks and gravel, a 1-inch galvanized iron pipe driven to a depth of 18 feet will prove to have a resistance low enough so that the ground connection will fulfill all requirements.

Where the soil is gravelly and rocky, the only means of obtaining a satisfactory ground is to install a plate laid in coke similar to the one already mentioned.

In order to make it economically possible to use the plate type of ground connection, it would have to serve as a ground for several transformers connected to a common ground bus.

DEPARTMENT STORE LIGHTING

(That the ideal fixture for department store illumination had not yet been produced was the final judgment of the management of this department store—and they therefore had one specially designed. The store is the largest of its kind west of the Rockies and the designer of the new fixtures is the well-known architect of the "Court of Abundance," Louis Mullgardt, who here tells of his work.—The Editor.)

The fixtures were done in rough plaster by the manufacturer, then dried and painted in the store itself

THE main idea in a department store is to see the goods, and any illumination which draws the eye away from them is a drawback rather than an asset. For this reason the usual type of opalescent fixture which is designed by attractive lines to lead the eye to the main feature of the lighting, the shining globe, has certain incurable disadvantages. In the first place, the source of light itself is not a thing of beauty—in fact, it is painful to the eye to look upon it—it is rather the pattern and texture of the surface illuminated which provides the pleasurable effect. In the second place, the lighting should not attract attention at all—it should attractively connect itself with the architecture of the ceiling and, together with the beauty of show cases or floor coverings, provide merely an unanalyzed background for the goods displayed.

These factors have been carefully considered in the fixtures recently installed in the main floor of the Emporium department store in San Francisco. The great height of the ceiling (21 ft. 3 in.) called for special intensity of illumination, but the glare of semi-indirect fixtures was felt to be offensive as well as markedly to increase the eyestrain of the store employees. Experiments were carried on at some length, attempts being made to light from the columns and with various types of bowls, but the expense of rewiring or of the metal and ornamental glass needed for effective fixtures was so great as to make the cost prohibitive.

The present fixture obviates these difficulties. The wiring remains unchanged, the fixtures hanging in the center of the 24 by 16 foot bays, usually over the center of the aisle. Eight 75 watt type C Mazda lamps are used in each, providing 600 watt illumination in contrast to the 400-500 watt used in the old type of fixture. The light is found entirely adequate even in the men's clothing and jewelry sections, where extra illumination has always been provided hitherto. Of course special showcase illumination for the showing up of precious stones or cut glass is further provided.

The fixture provides for entirely indirect lighting, being indeed made of plaster cement which is wholly opaque. This feature of the bowl is quite unique, but has worked out very satisfactorily. The great factor to its advantage, of course, is that it is extremely inexpensive. The ingenious method of perforating the bowl so that light filtering through the interstices makes the whole appear translucent, gives the material an effect of lightness and purity of texture which is very attractive.

The bowl is 30 inches across, and is hung so that the lower edge is 29 inches from the ceiling. With the idea of connecting the fixture more definitely with the ceiling architecture, the stem was at first made considerably shorter, but experimentation showed this to be the most effective height. The fixture is quite heavy, and in order to insure safety in the installation all outlets were tested by suspending a weight of 200 pounds from them before attaching the permanent globe.

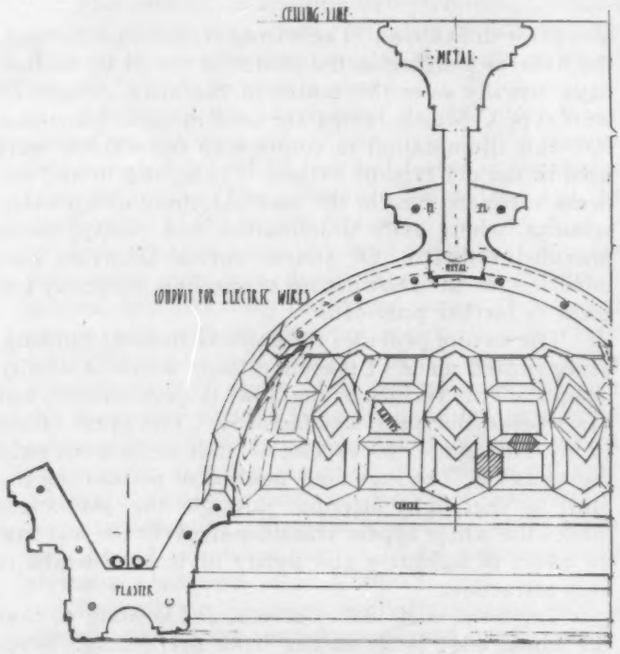
The problem of cleaning is the greatest in connection with their maintenance. In order to keep the illumination up to standard, not only the globes but the fixture itself must be cleaned regularly, as any dust on either diminishes the light reflected to a very appreciable degree. At first it was planned to dust everything carefully once a month, and a long ladder and an ordinary duster were used in the process. This resulted in too great a record of broken filaments and now a bellows is used to better effect. It is hoped

THE EMPORIUM ILLUMINATION

BY LOUIS CHRISTIAN MULLGARDT

The fundamental requisites of a department store count successful artificial lighting for proper display of goods on sale as a vital necessity. Department stores are invariably of such magnitude, and the obstruction caused by cases, shelving, counters, and goods on display, is so great as to make it physically impossible to satisfactorily illuminate the interior by any structural process of daylight illumination, as to make it necessary to rely upon artificial lighting, both day and night. The fundamental object in this instance was to design a fixture which would be simple and reasonably attractive and adaptable to the outlets which had been previously established and used in conjunction with the usual type of fixture, with an opal bowl, metal rim, suspended on chains, the lamps being arranged within the bowl and the light filtering through as well as being reflected against the ceiling. The ceiling resembled a succession of illuminated discs, with shadow lines cast by the conduit rod and suspension chains. The fixture here illustrated provides an absolutely indirect system of lighting, whereby the entire volume of light is reflected against the ceiling and thence refracted to illuminate the sales department. The visible illuminated surface on the ceiling shades off, from highest degree of intensity, immediately above the fixture, to an undeterminable distance in all directions without creating a disc or shadows within the area. The dome of the fixture is filigreed to admit the light within, giving the fixture a transparent appearance of lightness. The illumination created thereby falls equally from all sides to the sales space below and casts no shadows on a horizontal surface. The fixtures are made of plaster of paris, with the conduits concealed within the structure. The exposed surfaces are of a light ivory color, to match the ceilings and to make them as inconspicuous as possible. They may be made any color, or liberally decorated if desired, without altering the fundamental principles of indirect illumination.

eventually to have a blow pipe attachment and a convenient ladder arrangement which may be easily controlled from above, and yet not too bulky to permit of storage on the main floor. The lamps are cleaned once every four weeks, and the fixtures painted fresh every three months.



The wires are led down the stem to the junction box, thence through conduits along the ribs of the fixture to the trough, where they terminate in a socket

This system of lighting is carried throughout the main floor, where there are 176 fixtures in all, and is to extend to the second floor as well. Elsewhere in the store semi-indirect lighting is used except in the basement, where the records of eye trouble kept by

There are no shadows cast by these lamps either on the ceiling nor on a horizontal surface below. The Emporium is known as the "Dome" store, which makes this fixture particularly appropriate

the medical department showed the advantages of the indirect system. Although the ceiling here is comparatively low and artificial light must be relied upon altogether, there is now no greater eyestrain reported from this department than elsewhere.

The fixtures were designed by Louis Christian Mullgardt and manufactured by Thomas Day,

GROWING TRADE WITH NEW ZEALAND IN ELECTRICAL GOODS

The improved position that is being attained by the United States in sales of electrical goods to New Zealand during the war is expected to continue after normal conditions have been restored. An increased volume of trade will be produced in part by a more widespread use of electricity in that country, according to a report that has been published by the Bureau of Foreign and Domestic Commrece. A greater demand for the various appliances that add to the comfort of living is predicted.

The standard of living is good in the island, says the report, and there is an absence of a poor class, but there are some modern conveniences of which the people have not generally taken advantage. In the electrical field this is quite noticeable, a fact attributed in part to the rigid requirements of the fire underwriters and in part to the natural conservatism of the people.

Of the total imports of $2,300,000 worth of electrical goods in 1913, the United States supplied 15 per cent, England 65 per cent, Germany 5 per cent, and Sweden about 5.4 per cent. In 1914, during which the war made itself felt upon shipping, the total imports were valued at $2,136,000, of which the United States contributed 14.4 per cent, England 66 per cent, Germany 8.6 per cent, and Sweden 4.4 per cent. Imports amounted to $1,934,000 in 1915, the first complete year under war conditions, the United States supplying 18.8 per cent, England 70 per cent, Germany 0.7 per cent, and Sweden 4.2 per cent. Japan appeared in the field in 1915 with sales amounting to $12,800.

AMERICAN CHAMBER OF COMMERCE FOR MEXICO

American residents and firms in Mexico are considering the establishment of an American Chamber of Commerce in the capital. A committee appointed last month has submitted a prospectus in which the aims of the proposed organization are set forth. These are stated to be:

To establish a purely commercial and nonpolitical organization which will foster the friendly relations between Mexico and the United States, and which, in co-operation with the representatives of the United States in Mexico, will be able to initiate an active campaign for American trade;

To form a clearing house wherein business offered to firms outside their particular line may be promptly brought to the attention of such firms as are equipped to handle it;

To establish headquarters in Mexico City for local organization and for affiliation with chambers in the United States and with American chambers in the cities of Latin America and Europe;

To offer membership to American firms and American residents in the Republic and in the United States;

To secure correspondents throughout Mexico and especially in localities where no American consular officers are stationed;

To compile the information thus gathered and to distribute or utilize it for the benefit of members and for the promotion of American trade and industry;

To publish a periodical bulletin and market reporter, carrying paid advertisements, and ultimately to establish and let space for exhibits both of American manufactures and of the products of Mexico;

To take up such other activities as the members may determine.

LIGHT AND POWER PROBLEMS IN BRITISH COLUMBIA

(The recommendation of the formation of a Public Utilities Commission, was the conclusion reached by Dr. Adam Short in his recent report as Commissioner for the investigation of the British Columbia Light and Power Company. The survey was made by the Government at the request of the company, as a result of the strike difficulties in Vancouver last June. The situation reported, as it affects light and power service, is here discussed at length.—The Editor.)

Light and power are furnished to the City of Vancouver and the other districts on the mainland by the B. C. Electric Railway Company, through the Vancouver Power Company, one of its subsidiaries. The total capital invested in this plant amounts to $16,625,510. This is made up as follows:

Hydro-electric, Lake Buntzen-Coquitlam works	$8,343,668
Steam plant, Vancouver	1,194,386
Sub-station and transmission lines	3,715,774
Light and power distribution	3,371,682

The Company also buys power from the Western Canada Power Company under a contract entered into in 1913 and running for twenty years. The gross earnings from the light and power in Vancouver district amounted in 1916 to $1,475,723, made up from incandescent and street lighting $1,172,492, and commercial power $303,230.

In supplying Vancouver and district 79,848,302 k. w. h. were used for all purposes, including street railway. Of these 52,183,284 k. w. h. were employed for light and power, including street lighting.

Judged alike from the point of view of their application to the conditions of Vancouver district and by comparison with rates elsewhere, it must be admitted that the rates charged by the B. C. Electric for the larger quantities of power for commercial and industrial purposes are on the whole fair and reasonable. There is wisdom also in the policy adopted of making special low rates for industries which are able to use electric energy in large quantities, especially during a large proportion of the day, or, best of all, during the night or other off-peak periods. These rates, whether according to regular schedule or on special contract, compare quite favorably with those of Seattle and other favored centers. This is an important fact because it lies at the foundation of the future industrial development not only of Vancouver district, but of the whole Fraser Valley, as well as the Island of Vancouver.

As to street lighting, the rates are certainly exceptionally low, especially in comparison with what may be considered a reasonable rate of lighting for other purposes.

When we come to domestic light and power, however, we find that apart from the special cooking and heating rates the charges are high, especially for a hydro-electric plant. Moreover, it would appear that the higher rates act considerably as a discouragement to the use of light and power where they are taken through the same meter, as must be the case in the great majority of households.

In July, 1916, the number using not more than 12 k. w. h. for the month were 10,773, while in December the numbers were 4,347. On the other hand, the numbers of those who used over 12 k. w. h. were, in July 5679, and in December 13,472. Thus, for the month of July, nearly two-thirds of the accounts of the residential consumers did not meet the expenses of the company in serving them, and even in December one-quarter of the consumers were in the same position. Two conclusions inevitably result from such a situation: First, that the company should follow the sound practice of the majority of the electric light corporations, municipal as well as private, and make a minimum monthly charge of not less than 50 cents, which would meet approximately 50 per cent of the cost of maintaining the service. On the other hand, by lowering the rates for domestic light and power there would be a very direct incentive to use the current more freely and more regularly. This applies not only to the large number who are unprofitable consumers, but to those who take a larger portion and might easily be encouraged or induced to employ electricity more freely, not perhaps so much in the line of light as in the greater use of the rapidly extending comforts and conveniences which are now placed at the disposal of the community and which furnish a very considerable substitute for the power and heat derived from coal.

No more striking example of what may be accomplished in the way of rapidly extending the use of electrical power, both as to the quantity employed and the range of its uses, is furnished than by the City of Winnipeg. The use of electricity for cooking and heating has particularly expanded in this city, owing to the exceptionally low rate of 1 cent per k. w. h. There are now in use over 35,000 meters.

The net result of the Winnipeg experiment is that through low rates and active canvassing, which chiefly consists in explaining to consumers, whether actual or prospective, the many advantages to be obtained from a more extensive use of electricity, the heavy deficits which were at first faced are now converted in a small but respectable surplus, which bids fair to increase steadily.

In Winnipeg as elsewhere a minimum monthly charge is exacted, the amount being 50 cents for light and $1.00 for power. The management has also adopted and strongly advocates a system of customers' deposits. The amount is $3.00, and on this interest at 6 per cent is allowed. Out of the 35,000 meters is use during the past year there were 18,000 removals.

The possibilities for extending the market for electrical power are very much greater than the corresponding possibilities in the case of a street car service. Apart from the original location of one's abode or place of business, only to a very limited extent will a reduction in car fares induce extra travel, because the normal use of cars is incidental only to one's business or other settled requirements. But in the case of electric power every reduction in rates places within the range of the consumers new or enlarged opportunities for acceptable services which once adopted, an extension of use is natural, especially if rates continue to decrease.

THE LIGHTING OF A MUSEUM

BY CLOTILDE GRUNSKY

(It being the object of a museum to show things, it is necessary that the exhibits be adequately illuminated. The difficulties of cross reflections in the glass cases and the special features of lighting animal groups to simulate the wild life in the outdoors offer problems which need ingenuity as well as knowledge of illumination practice for their solution. The effective use of electricity, not only in the main lighting of the building, but also in special spectacular features, is one of the great assets of the Academy of Science Museum in San Francisco.—The Editor.)

Some of the groups are shown always under artificial light—others only when the daylight which filters through the skylight is not adequate

THE two-fold purpose of a museum—to provide material and opportunity for research work and to display certain of its collections for the benefit and entertainment of the public — makes the task of the lighting of such a building one which presents problems of particular interest.

The Academy of Sciences, located near the Music Stand in Golden Gate Park, San Francisco, is the largest museum of the Pacific Coast and perhaps the finest in certain of its exhibits of any in the United States. The major work of the institution, of course, is carried on in its research departments. Extensive collections of reptiles, fossils, insects, botanical specimens and the like, are stored away in drawers or cases for the use of students and scientists doing special work. New investigations, expeditions for the collection of data and the publication of information and discoveries as made form the routine work of the staff of scientists. Further than this, the museum provides weekly lectures of scientific interest open to the public, and maintains a regular exhibit museum.

As can be seen, the lighting of such a building involves features of office building lighting, library problems, the proper illumination of the lecture hall as well as the peculiar problems involved in the lighting of exhibits. In order to understand the difficulties of this latter problem, it is necessary to have an idea of the plan of the museum.

There are three large exhibit halls, 180 feet in length by about 60 feet in width. Of these one is filled with a very fine loan collection of Indian baskets and ware, the other two are devoted to so-called "Habitat Groups." The birds and mammals of the Pacific Coast are featured in these groups, being presented as they are found in nature. The backgrounds are painted by the finest artists obtainable so as to merge imperceptibly into the foreground where the trees and shrubs and flowers, even the rocks, of the animals' native haunts are reproduced. The animals themselves are carefully mounted on specially modelled forms and are presented in life-like attitudes carefully studied from animals in the field. Even the footprints of the deer in the snow, or the smears of mud from the wallow in the marsh, are complete and the illusion is so perfect that it is impossible to believe that photographs taken from the groups were not made in the open. These exhibits are unquestionably the finest of their kind found anywhere in the world today, surpassing even the similar groups of the Natural History Museum in New York or the Chicago Museum.

The groups are arranged on either side and at the end of the exhibit hall. In the mammal collection there are six compartments on either side, some 25 feet long by 13 deep. The background is semi-circular to keep the illusion of the picture, the top covered by a ground glass skylight, and a great pane of plate glass shielding the exhibit from the observer. At the end is the largest group of Rocky Mountain sheep, and in

The new type of museum illumination does away with reflections in the glass case and permits you the illusion of looking out into the open. This is not a clever snapshot taken in the mountains, but a time exposure of a "habitat group." The lighting is done through a skylight above which diffuses the light and does away with shadows.

A sunset scene which depends for its effect wholly upon artificial illumination. The skylight above gives the effect of daylight, but the light comes from two 500 watt lamps. Note the box screen at the side, which conceals a lamp and reflector focussed on the sunset to enhance the radiant effect.

the center of the hall are flat exhibit cases containing butterflies, shells, and other groups of scientific interest.

It is obvious that the main object of the illumination is to light the picture groups so that they will appear as windows through which the observer looks out into the open. At the same time it is necessary for the main hall to be sufficiently light to permit of the adequate examination of the center exhibits. The main difficulty lies in the balancing of this illumination so that no group is so lighted as to be reflected in the glass of the exhibit opposite, and the spectators are sufficiently in darkness so that they themselves are not mirrored in the exhibit they are facing.

In the daytime this result is obtained by the effective use of skylights. A double system of skylights —a small one arranged some four feet above the large one—over each group, obviates the possibility of sunlight falling directly on the animals, which would fade them rapidly, and at the same time provides for an adequate diffusion of light without shadows more than would be found in the open. The lighting of the main hall is by means of a narrow central skylight which provides just light enough not to have the central objects reflect in the glass of the exhibits.

This effect is duplicated at night. Above each habitat group two 500 watt Mazda lamps with wide, flat reflectors are placed, located just to the rear of the upper skylight so as not to cast shadows or interfere with the daylight illumination, and yet to give the effect of the rays of light falling at practically the same angle as during the day. The fixtures are constructed of metal with the inner surface painted white, so arranged that they are above the point of sight from the railing in the exhibit room. The carefully gaging of the strength of illumination and the diffusion of the light through the second skylight of ground glass is so successful that it is almost impossible to tell when the lights are turned on in the late afternoon except for a general brightening of the scene. Experiments as to the color of lamp used or possibly the type of medium through which the light should fall to produce the proper daylight effect, were carried out without much success, and finally the ordinary type of lamp was adopted which, fitted through the skylight, very successfully produced the daylight effect.

The main body of the exhibit halls at night is lighted from a series of lamps concealed in troughs just above the moulding. The shape of this trough is so planned that there will be an even diffusion of light over the entire ceiling with the lamps in a vertical position and so arranged that they cannot be seen from the floor line. The inner surface of the reflector is painted with several coats of white enamel and reflects a subdued illumination which is adequate without being too intense by comparison with the groups.

Artificial illumination, providing it can be made to bring out proper color values and not to cast shadows, has certain advantages over the daylight. It can be maintained always at the same intensity, and it does not fade the skins of the animals, a feature of considerable importance where many of the specimens are impossible of replacement. It has also the further advantage of adaptability for spectacular features.

This is made use of in the latest and perhaps the finest group to be added to the collection, that of the ducks and geese of the Los Banos country. This is a sunset scene, showing the marshes and the distant hills in the sunset light. A line of geese is flying into the picture and alighting in the foreground among the other groups of birds. The illusion of reality is particularly fine in this picture. The subdued light is that of sunset, and it seems almost as though the glow radiated from behind the hills. As a matter of fact, to a certain extent it does. The entire scene is artificially illuminated, and besides the lamps above, properly subdued to give the evening effect, a special lamp with a reflector and a concealing shield, is hidden at the side of the picture and focussed directly upon the sunset so that this portion of the sky is actually brighter than the rest.

The museum is incomplete, the present building representing only one wing of what the final building is to be. The conduits running from the city street through the park to the main cut-off are planned to be of a size sufficient to install the wires for a building of three times the size today. Besides these additions planned, the Academy of Sciences has recently been

left $250,000 through the generosity of the late Ignatz Steinhart for the purpose of equipping an aquarium to show the marine life of the Pacific Ocean, the richest in marine life of any body of water of the globe. The illumination of this building when constructed, with the proper lighting of tanks for night-time display, will call for the greatest ingenuity and skill. Museum methods are constantly improving—and with them the systems of lighting and the more efficient use of artificial illumination.

A PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(In this primer of inductive interference, the author gives us the essential elements of one of the most difficult problems which confronts users of parallel lines for electric service. The principle in simple terms is that of the transformer. How it is possible to neutralize the induced current by transpositions of wires in an all-metal circuit and the difference in the problem when the current is returned through the earth, is here pointed out. The author served as special investigator with the Joint Committee on Inductive Interference in their study of this problem.—The Editor.)

The first article discussed the fact that two electric circuits running side by side can be considered as primary and secondary of a transformer, with respect to magnetic induction (the current in one circuit due to variations in the magnetic field set up by current in the other). A trolley circuit paralleling a telegraph line was used for illustration.

Evidently the same analogy holds where the earth return is replaced by a wire or wires, as in an all-metallic circuit. However, when both sides of the circuit are metallic, the two (or more) wires can be interchanged, or transposed, so as to neutralize the induction in one portion by that in another. Thus, in

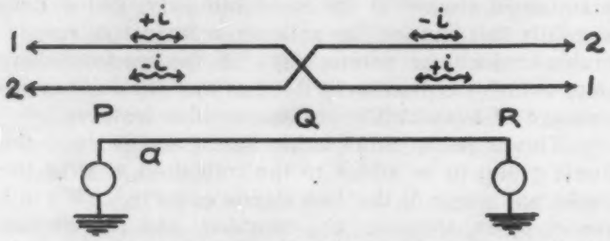


Fig. 1.—A two-wire circuit uniformly exposed to a single-wire circuit with an earth return

Fig. 1 we have a two-wire circuit uniformly exposed to a single-wire circuit with earth-return. This might represent either a telegraph circuit, paralleled by a two-wire power circuit, or a single-phase trolley circuit paralleling a metallic telephone circuit. With the transpostion placed in the two-wire line at the center of the exposure the induction in the one half opposes that in the other half, and the resultant disturbing effect is reduced to zero (neglecting minor auxiliary effects, which in practice make it necessary that the length of exposure in which the neutralization takes place be short).

To examine the matter more closely, consider the two-wire circuit to be a power circuit with current + i in wire 1, and — i in wire 2. Due to the interchanging of position of wires 1 and 2, the inductive effect of wire 1 with current + i, from P to Q is neutralized by that of wire 2, with current — i, from Q to R. Likewise the inductive effect of wire 2 from P to Q is neutralized by that of wire 1 from Q to R. Another way to look at it is to note that the transposition causes wires 1 and 2 to occupy the same average position from P to R, with respect to the disturbed circuit, "a."

It can also be shown that if "a" be considered as the disturbing circuit, the inductive effects along wires 1 and 2 are equal, and that they tend to cause currents in opposite directions through the circuit having wires 1 and 2 as its sides, which neutralize each other. In any case, the important principle is, that where either the disturbing or disturbed circuit (or both) are all-metallic, transposition of the wires makes it possible

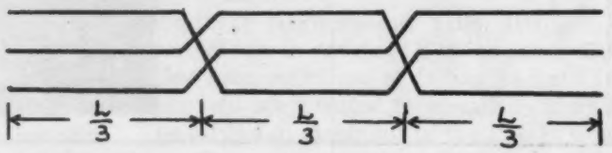


Fig. 2.—A simple method of transposing a circuit having three wires

to produce mutually neutralizing effects in adjacent portions of the exposure. Fig. 2 shows the simplest arrangement for transposing a circuit having three wires.

In a circuit having wires for both its sides, as 1-2 of Fig. 1, the wires are ordinarily within a few feet of each other, and the inductive effect of the current in one side is partially neutralized by that of the equal and opposite current of the other side of the circuit, even where the circuit is not transposed. It has been found by experiment that the current in the earth goes well below the surface. Thus the magnetic induction with an earth-return circuit is such as would be experienced if the earth were replaced by a wire at a depth of several hundred feet. The neutralizing effect of the earth-current is therefore much less than when the circuit is completed through a wire, unless this wire is at a great distance, as in the case of some "single-wire" series street lighting systems. Consequently, earth-return circuits are much more susceptible to inductive disturbance than metallic circuits.

The entire discussion thus far has dealt with magnetic induction, resulting from the current in the disturbing circuit. It is proposed to discuss next the effects of the voltages, or potential differences, of the disturbing circuit.

ELECTRICAL ENTERPRISE IN JAPAN

Electrical enterprises are not marked by any boom, but a fairly steady development is being made, according to the Japan Advertiser, which quotes the electrical bureau as stating that at the end of November there were 674 electrical enterprises in the country and the funds invested in them amounted to 680,886,899 yen ($339,422,119).

Compared with the corresponding time last year, there is an increase of 50 in the number of enterprises, and of 23,539,737 yen ($11,734,559) in the combined capital. The power supply, too, shows an increase of 131,706 kilowatts. In this respect it is noted by the Advertiser that the supply from steam power plants shows a larger increase—73,163 kilowatts—while the increase in water power is 58,543 kilowatts.

WOMEN IN THE INDUSTRY

(Woman's sphere used to be confined to the home, but the world is beginning to recognize that she has a responsibility to the outside world as well—and that even in the home the woman is an essential part of business. This recent convention of salesmen's wives called by the employer of the salesmen is but one of the signs of a time which is granting more to woman by the way of rights—and asking more in responsibility.—The Editor.)

A CONVENTION OF SALESMEN'S WIVES

In view of the suggestion of putting wives to work in the place of husbands who go to war, the recent convention of the wives of salesmen connected with the National Cash Register Company at Dayton, O., as reported in Forbes' Magazine, is latent with possibilities.

The basic idea was to give the wives an insight into the business of their husbands, to show them exactly how cash registers are made, to explain to them how they could actively aid their husbands in promulgating the introduction of cash registers into stores, and to so familiarize them with their husbands' affairs

An assemblage of wives who met to learn their husbands' business

that they would go back better help-mates, more intelligent companions and more sympathetic critics.

The results astounded everyone. There were lectures, there were visits through the plant, there were pageants, and there were playlets built around the cash register; there were illustrated talks, moving picture entertainments, concerts, drives through the country, talks by executives and addresses by notables from various parts of the country.

From the time a delegate left home all her cares were looked after by the company. Each woman knew exactly what hotel to go to and which room she would occupy. Each one was given a badge with her name printed on it so that introductions were unnecessary. The name of each delegate was printed and hung on the back of the chair she was to occupy in the great hall of the company. A beautiful portfolio, to hold papers and containing writing paper and postcards, was handed to each, also with the name printed on it in gold. A tiny newspaper was issued every morning and distributed to all. On the trips through the factory, as the visitors entered each department they were handed an illustrated card telling the number of employees and describing briefly the work being done. A booklet was printed giving the name and home address of every delegate and her address while in Dayton. And each day every woman knew where to find her place in the company's spacious dining room.

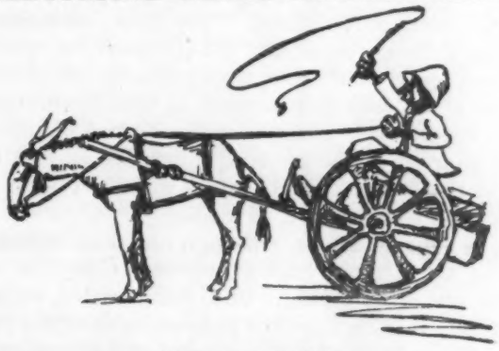
The whole plant of the cash register company is dotted with mottoes year-in, year-out. One giant placard gave a list of things the wife of a salesman can do to help her husband. They are not inapplicable to other wives! Here are some of them:

Serve simple food.
Keep him cheerful.
Give him plenty of fresh air.
See that he gets plenty of sleep.
Lend encouragement at the right time.
Take a real interest in his sales record.
Encourage him to take regular exercise.
Be economical and save for a "rainy day."
Study merchants' needs and help with "tips."

At its close, one of the local newspapers thus summed up its significance: "The convention is over, but from all indications its effect will be felt for months and years to come. A small army of women—all leaders in their own communities—are today on their way to their homes in all parts of the United States and the Dominion of Canada. They are carrying back with them thoughts and ideas which they will promulgate among their friends, neighbors and members of their women's clubs, to the end that a greater degree of cooperation will be established between womenkind and the Government; they will use their influence to make every housewife in their community understand the emergency which confronts our country and conserve food and materials which are so badly needed in the successful prosecution of the war."

Mr. Patterson announced that he was so convinced of the value of the experiment that he proposed to make conventions of the men's wives a regular feature of the company's activities.

ELECTRICAL TERMS ILLUSTRATED—IV



Plugs and Switches—
have their legitimate place—but for delivery purposes, use an electric truck.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(There is no question but that the public utility should be permitted to share in the prosperity which it helped to create, but if the principle of recognizing this appreciation in value as a legitimate part of the rate base is accepted, the question is where to stop. In order to do full justice to the utility which renders just as great a service but does not perhaps possess appreciating property, an allowance should be made in the earnings for participation in general prosperity. The author is the well-known consulting engineer and expert on valuation problems.—The Editor.)

APPRECIATION IN RELATION TO RATES

The value of an income producing property is ordinarily determined from its earnings. As its net earnings increase its value increases. There may be a material increase of value, therefore, without any increase of investment. The earning power of public utilities, as a general rule, if rates remain stable, increases as population increases, although not necessarily in the same ratio. The appreciation or increase of value which results when net earnings, in their relation to the investment, are increasing follows no definite law and it cannot be forecast with that degree of certainty which can, with some reason, be claimed for depreciation. Just as depreciation represents a loss so does appreciation or increase of value without increase of investment represent a gain. It is an unearned increment which results from the changing conditions of environment.

Usefulness in service, and therefore value, does not always decrease, but may sometimes increase with age. This may be the case with a dam, or with a railway embankment which become more dependable with advancing age. Increasing value may also result from an advance in the price of labor and materials, or from changes in the conditions under which an enterprise was first established which would render more expensive the construction or establishment of the enterprise under the altered conditions.

Stated broadly, values as expressed in terms of money are increasing. This applies not alone to the value of real estate and water rights and like properties, but also, the same condition of serviceability being assumed, to physical elements generally, and to intangibles. It is also true that, as a general rule, public utilities are to be included among the principal factors which are responsible for the growth of communities, and that when viewed in this light, the owners thereof are entitled to participate in the unearned increment or in the general prosperity just as the land owner participates. They do so, of course, as their business increases, but if held down to earnings which will only yield the ordinary interest rate on safe investment or only the interest at which, for use in similar enterprises, money can be borrowed, the extent of sharing in the general prosperity may fall far short of the rate at which values generally, and particularly land values, are advancing.

Such considerations, although not thus expressed, have led the United States Supreme Court to hold that the owner of a public utility is entitled, in most cases at any rate, to have the present value of his property made the basis of the computation when rates are to be fixed. In the Consolidated Gas Co. case (Wm. R. Willcox et al. vs. Consolidated Gas Co. of N. Y., 212 U. S. 19), the court says:

> **"And we concur with the court below in holding that the value of the property is to be determined as of the time when the inquiry is made regarding the rates. If the property which legally enters into the consideration of the question of rates has increased in value since it was acquired, the company is entitled to the benefit of such increase. This is at any rate the general rule. We do not say that there may not possibly be an exception to it where the property may have increased so enormously in value as to render a rate permitting a reasonable return upon such value unjust to the public."**

If this view be accepted, as it is by those who consider rate-base and present value synonymous, the question is where to stop. Must this matter of adding appreciation and allowing a return thereon as though it were additional investment go on forever? If this is the theory its application will hasten universal public ownership of public utilities. Should not a limit be set and thereafter the rate-base remain unaffected by appreciation? The allowance for appreciation, or better, an allowance for participation in general prosperity, should then appear in the earnings. The owner should be allowed a fair amount of current appreciation with which he may do what he pleases, and the public will hold down the rate-base to what is estimated to be the properly invested capital at the time the rate-base was established. The court has apparently overlooked the fact that an unearned increment can be thus allowed in the earnings, and that if thus allowed the public utility which has no appreciating real estate will fare as well as those public utilities which own large areas of land or other appreciating properties.

In weighing the question whether or not appreciation is to be added to the rate-base, consideration may be given to the alternative of the rental value of equivalent property. Suppose for example that among the properties owned by a public utility there is a large tract of land located in a region in which real estate values are advancing normally. If instead of acquiring this land the owner of the utility had entered into a lease thereof based upon an agreement that the rent from year to year should be commensurate with a proper valuation of the land, the amount of the rent increasing from year to year would be included in the cost of operation and rates would be fixed as though, in the case of actual ownership, the rate-base had included appreciation.

While by such reasoning a sound foundation may be laid for the inclusion of appreciation in the appraisal of the rate-base, there will always be some cases in which appreciation has been so great that it

would be unfair to the rate-payer to let the full benefit thereof go to the owner of the utility. Why should not the public, and particularly the rate-payer, be allowed to participate in a measure in the unearned increment which is the result of general prosperity and development of resources and, therefore, in part attributable to the presence of the rate-payer? Not only may such questions be asked, but it will be proper to consider that while it may be a simple matter to determine from time to time the appreciating value of land, this may be difficult and uncertain in the case of other kinds of property.

The difficulty of conforming to the decision of the United States Supreme Court in the matter of allowing the appreciation of real estate was felt by the Interstate Commerce Commission of the United States, which says in its opinion in the Western Advanced Rate Case (20 I. C. C. Rep. 344, decided February 22, 1911):

"Certainly if the Supreme Court may decline to lay down the absolute rule that 'in every case failure to produce some profit to those who have invested their money in the building of a road is conclusive that the tariff is unjust and unreasonable' (Reagan vs. Farmer Loan and Trust Co., 154 U. S. 412), it is a conservative statement of the law to hold that a railroad may not increase the rates upon a number of commodities solely because its real estate has risen in value."

"While it is evident, therefore, that each case must be decided upon the facts peculiar to it, the Commission believes it proper in this case to follow the general rule, as stated by Judge Hough of the United States Circuit Court (Consolidated Gas Co. vs. City of New York et al., 157 Fed. Rep. 849, 855), 'Upon reason, it seems clear that in solving this question the plus and minus quantities should be equally considered, and appreciation and depreciation treated alike.' * * * Thus land has been taken at its fair value and not at its original cost, and the annual appreciation of land has been treated as a profit. By this method all property is treated absolutely alike, as Judge Hough suggests. No difference is made, except that as depreciation represents a decrease in assets, it is placed as a debit against operation, while appreciation is placed as a credit because it is an increase in assets."

The difference between the ordinary treatment of depreciation and of appreciation results from the fact that in the case of depreciation, which is continuous and can be estimated, a definite annual allowance can be made in the earnings to offset it, while in the case of appreciation, which cannot be estimated from year to year, it is not ordinarily treated as revenue. When the occasional appraisal discloses appreciation it is treated as profit. The Interstate Commerce Commission believes that depreciation and appreciation should be treated alike. The United States Supreme Court holds that the owner of the public utility is entitled to the appreciation unless the same is excessive in amount. It would be much simpler, as already stated, to grant to the utility, after a rate-base has been properly determined, some reasonable share in the general prosperity not measured solely by the value increase of real estate and other property, and preferably brought into some relation to the volume of business instead of to the rate-base. Under the ruling of the courts, however, in determining present value there is no escape from a consideration of reproduction cost and the reproduction cost will include appreciation. Under this ruling all relation between actual original cost and permissible earnings may be lost. When the courts shall have accepted the view that "fair value" is not the proper starting point, then the importance of making close estimate of cost of reproduction, which includes both depreciation and appreciation, will fall away.

PUMPING ON IRRIGATION PROJECTS

In a recent number of the Irrigation Record, Jas. M. Gaylord, electrical engineer in the Reclamation Service, points out some of the factors in pump installations for irrigation purposes. With the continued development of irrigation projects the pumping of water is becoming more and more important. Many of the more desirable gravity projects have been taken up and future development turns more and more to power as a means of putting water on the land. In some cases an entire project or unit is irrigated by pumping; in others high land exists as an isolated area in the project or at the borders of a project and a small pumping plant is desired for an individual ranch or group of ranches. Pumping from wells is practical in many places, and some large areas are entirely dependent on this source of water supply. Drainage pumping is also requiring more and more attention as continued irrigation increases the necessity of drainage.

The centrifugal pump is most commonly used in irrigation work and in its various styles is adapted to a very wide range of conditions. This type of pump is simple and has few parts, but its very simplicity often leads to waste of power as the operation may appear almost perfect, whereas in reality the efficiency may be very low.

The efficiency to be obtained from centrifugal pumps has been greatly increased within the last few years and it is now possible to obtain efficiencies of 60 to 80 per cent, where formerly 25 to 50 per cent was the rule. Increasing the efficiency effects a proportional reduction in the power bills and it is of great importance to make sure that the pump is operating under conditions of maximum efficiency.

The centrifugal pump is not very well adapted to very low lifts, namely, less than 10 or 15 feet. A type of pump which is designed to meet the conditions requiring large quantities of low lift is the screw pump. The Reclamation Service is installing two screw pumps on the Yuma project, where they will be used to pump drainage water into the Colorado River.

For still lower heads, from 1 to 5 or 6 feet, a very satisfactory and efficient pump is the scoop wheel. This pump is constructed after the fashion of an undershot water wheel reversed and driven by a motor. Some very successful pumps of this style are in use on the Minidoka project, where efficiencies of over 70 per cent have been obtained. These wheels are built principally of wood, only the shaft and gearing being of metal. They are cheap to build, and the small power requirements, little attention required, and freedom from expensive repairs make their operation very economical.

In general it may be said that the success of a pumping plant depends upon accurate determination of the physical data, the selection of apparatus adapted to the conditions, and systematic attention to the details of the operation and maintenance of the equipment.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(The importance of water use to the electrical man—both as a source of power and in its application to irrigation with the growing use of electric pumps, makes it essential that he possess a knowledge of water rights and laws. Recent decisions and interpretations of the law in the West are here given. The writer is an authority on the subject and the author of a new book on Western Water Law which is now available for distribution.—The Editor.)

WATER RIGHT AGREEMENT UPHELD

West Side Irrigation Co. v. United States, 246 Fed. 212

One of the many benefits flowing from the operation of the Reclamation Act, in addition to the actual construction of large irrigation projects, has been the harmonizing of other interests on the same water system. The Sunnyside project of the Reclamation Service is situated in Central Washington, in the Lower Yakima Valley. A number of canal systems diverted water from the Yakima Valley above the Sunnyside Canal, which was purchased by the United States. The service aimed to very materially increase the low water flow of the Yakima by storage in lakes on its upper reaches. In order to assure the Sunnyside project a safe water supply, however, it was necessary in some way to definitely determine the rights of the upper canals. After much negotiation it was decided by the parties in interest that an agreement should be executed by each canal company, limiting its water supply to a specified amount during the irrigation season.

One of the canal companies entering into the agreement was the West Side Irrigation Company, which was limited to 80 cubic feet per second from April to Sepetmber inclusive, and to 34 cubic feet per second during October. The agreement was executed in October, 1905. After the construction of the Sunnyside project the West Side Company diverted in excess of the stipulated amount, and suit was entered by the United States to enjoin it from so doing.

Settlement of water rights by agreement in this way was entirely novel at the time the agreement was executed. There was considerable doubt as to the legal sufficiency of such agreement, principally on account of the lack of material consideration. The United States Circuit Court of Appeals, however, in this case has upheld the contract. In answering the argument that there was lack of consideration, the court held that the company and others entering into the agreement had "received the benefit of the adjustment of all conflicting water rights and the benefit of the expenditure by the United States of a large sum of money in the county in which their lands are situated; and, on the other hand, the United States, relying upon the agreement so made, entered upon the execution of the reclamation scheme and therein, at the time of the commencement of the suit, had expended for construction and reclamation $6,866,500."

Among the many points presented by counsel for the company was the argument that there had been a mistake in regard to the quantity of water; that the stockholders of the company had been using 4000 inches of water under their method of measurement, and that in executing the contract they thought they were securing the equivalent thereof in being allowed 80 cubic feet per second. It contended that the 4000 inches were in reality equivalent to 90.4 cubic feet per second. The court held, however, that the evidence was not sufficient to sustain the contention that the stockholders and officers of the company did not understand the expression used in the contract. This case is but another of the many controversies constantly arising from the use of the unit "inch"—a unit which not only varies from state to state, but very often from community to community.

INDIAN RIGHTS IN THE USE OF WATER

Byers v. Wa-Wa-Ne, 169 Pac. 121

In determining the rights to the use of the waters of the Umatilla River in Oregon, an interesting point was presented as to the right to water of a flour mill as against the rights of the Umatilla Indians.

In 1870 the agent in charge of the Umatilla Reservation issued a permit to certain parties to construct a ditch across part of the reservation to take water from the Umatilla River to the city of Pendleton. The rights acquired under the permit subsequently passed to Byers and the water was used to supply power to a flour mill at Pendleton. The Supreme Court of Oregon in this case has made a careful analysis of the original treaty with the Umatilla Indians, as well as the later congressional acts in regard to the reservation and allotments to the Umatilla Indians. Beginning with 1884, a number of attempts were made to pass an act confirming the water rights of the Byers mill, which then rested upon the authority of the revocable permit only. In 1885, a congressional act was finally passed confirming the Byers water right, with the following proviso:

"Provided, that this act shall in no way impair or affect any existing right to a reasonable use of the water of said stream for agricultural purposes, nor shall confirm or grant any right to use the water thereof in any manner nor to any extent beyond or different from that to which it has been heretofore appropriated."

It was this proviso which caused the most serious discussion in the present case. The court held that the rights of the Indians are paramount only to the extent of water which they require for household use and the watering of live stock, and that with this qualification, the rights of the Byers mill are superior and paramount to those of the United States, as guardian of the Indians.

The decision is of unusual importance for the reason that many attorneys hold that "the mere creation of an Indian Reservation by treaty impliedly secures to the Indians all water in streams which touch the reservation which they may at any time desire to put

to a useful purpose." This idea is founded upon two decisions by the United States Supreme Court dealing with Indian Reservations in Montana, in each of which cases the title of the Indians to the use of water was held to be superior to that of upper users, even though the latter had used water for a number of years, and the Indians had used none.

It is clear from the opinion in the present case that all the circumstances surrounding the particular case must be weighed, and that no sweeping rule can apply.

CALIFORNIA MUNICIPAL WATER DISTRICT ACT HELD VALID

Henshaw v. Foster, 169 Pac. 82

The case deals with an attack upon the constitutionality of the Municipal Water District Act, approved by the California Legislature May 1, 1911, and later amended December 24, 1911, and May 29, 1915. Certain owners of land in San Diego county brought this action to enjoin the Board of Supervisors of the county from calling an election for the purpose of determining whether or not a district to be known as the San Diego Municipal Water District, should be incorporated under the provisions of the act. The district, as outlined in the petition, includes land not now within any municipality, as well as the territory of three incorporated cities—San Diego, East San Diego, and La Mesa, and that of one irrigation district, known as La Mesa, Lemon Grove and Spring Valley Irrigation District.

The plaintiffs contended that the act is in violation of a number of constitutional provisions, principally dealing with the powers and privileges of existing municipalities. It was argued that the inclusion of the three cities within the district would result in "an intolerable clash of authority between the governing bodies of these municipalities and the trustees of the water district." The inclusion of the La Mesa, Lemon Grove and Spring Valley Irrigation District was also contended to make the formation of the district invalid.

The Supreme Court of California, however, upheld the validity of the act and all the proceedings on every ground of attack.

PORTLAND GALVANIZING WORKS

BY F. D. WEBER

The new wooden ship of 3500 to 4000 tons contains approximately 150 tons of iron and steel, which must be galvanized. In the past this galvanizing was done in the Eastern part of the United States, but now there is a great demand to have this work done in the immediate vicinity of the construction yards. As a consequence of the close proximity of the Portland Galvanizing Works to the shipbuilding centers of the West, their business is expanding rapidly.

About five years ago this plant was established, and one man and a boy handled all the work turned out. Now the force consists of forty-five employees, and two shifts are run.

Two processes are handled at this plant—electro-galvanizing and the hot-dip process.

For handling the electro-galvanizing process there is installed one 15 horsepower, 220-volt, 3-phase, 60-cycle induction motor, direct connected to a 1500 ampere, 5-volt direct current generator. Also a 10 horsepower, 220-volt, 3-phase, 60-cycle induction motor drives a rotating plating barrel, and a 200-ampere, 15-volt direct current generator for the copper shop.

Before a metal can be properly galvanized it must be thoroughly clean, and for this purpose it is treated by an electro process of cleaning (the reverse of plating) or treated with dilute sulphuric acid.

After being thoroughly cleaned, the metal to be galvanized is suspended in tanks of sulphate of zinc solution with the electric current flowing for 45 minutes to one hour, when the metal is removed and brushed with steel brushes and water and again subjected to the galvanizing bath. This process can be repeated as many times as desired, if between each coat the metal is well brushed with the steel brushes and water in order to make each coat adhere.

The three new buildings of the Portland Galvanizing Works

Small parts, such as nails and screws, are handled in baskets, and scrubbed in rotating cylinders.

In the hot-dip process the metal is thoroughly cleaned by boiling in sulphuric acid solution and scrubbing, by means of a rotating sand blast barrel, or by the use of a stationary sand blast apparatus. After the metal has been cleaned it is dipped, by means of small hand cranes, into a molten zinc bath, the temperature being about 850° F.

The rotating sand blast barrel is driven by a 12 x 10 air compressor, which in turn is driven by a 50 horsepower, 220-volt, 3-phase, 60-cycle induction motor. This apparatus is an immense cylinder, in which the metal is placed and inside of which there are four sand blast nozzels so directed that they cause the cylinder to rotate while the cleaning process is going on.

The compressed gas is furnished by two compressors driven by 5 and 10 horsepower, 220-volt, 3-phase, 60-cycle induction motors.

After the metal is galvanized and removed from the galvanizing kettles, all drops of zinc on the edges are wiped off and all black spots scrubbed off with a brush and cold water.

The future of this new industry in Portland depends upon the shipbuilding industry, and at present prospects look very bright.

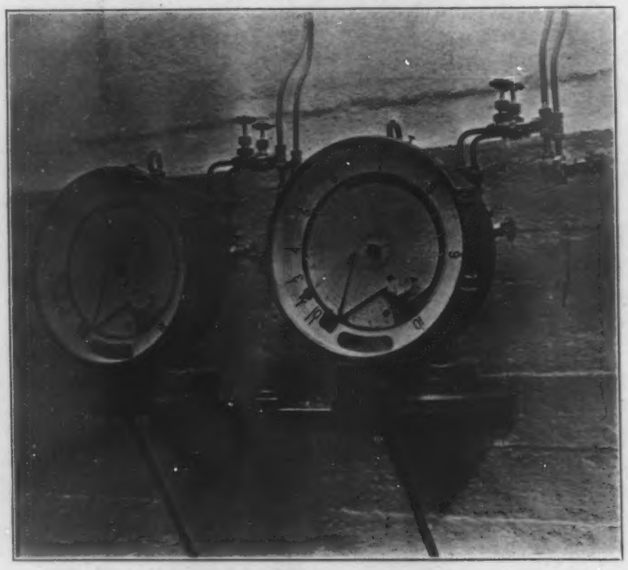
FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Economy in steam power generation, where oil is used as a fuel, demands the careful study of the steam that is diverted for use in atomization of the oil. Here are some suggestions as to how this steam may be measured quantitatively. These suggestions, among others, are being embodied in a book on the elements of fuel oil and steam engineering by the authors, profusely illustrated and composed of over three hundred pages, that will be available to the trade April 1, 1918.—The Editor.)

MEASUREMENT OF STEAM USED IN ATOMIZATION

As has been previously set forth, there are three methods used in pulverizing or atomizing the fuel oil in the industries for heat generating purposes, namely:



A Typical Steam Meter

by compressed air, by steam, and by some mechanical operation.

In any one of these instances the actual expenditure of energy necessary to accomplish this result when converted into heat units should be charged as a loss in furnace operation, when the efficiency of the boiler as a whole is being determined. And if this energy is taken from the steam that is being generated in the boiler, then the net steam energy should be computed by subtracting from the gross production such steam as may be used in atomization.

It then becomes the task of the steam engineer to construct some accurate and convenient apparatus whereby this may be easily and accurately accomplished.

There are steam meters on the market that may be utilized for this purpose, and if a careful design is picked, the measurement may be relied upon. Many engineers, however, prefer the use of a standardized orifice or the construction of an apparatus of their own whereby this important data may be ascertained with accuracy.

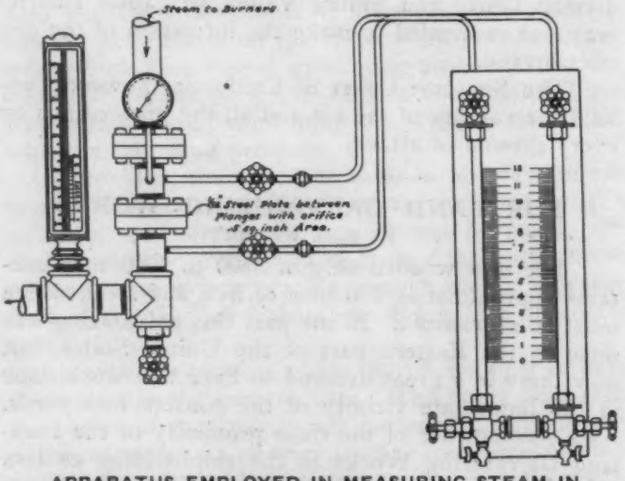
Mathematical Expression for Flow of Steam.—In the mathematical considerations involved in establishing a formula for steam flow through orifices, a rather unique incident is encountered. When the pressure of the lower medium into which the steam empties itself is less than 58 per cent of the higher pressure, a certain formula applies. And the rather remarkable thing is that below this point the flow is neither increased nor decreased by a reduction of the external pressure, even to the extent of a perfect vacuum. This was the basis upon which Napier's formula was derived in the article on Steam Calorimetry, wherein a formula was given to compute the steam utilized for operating the calorimeter. In this formula is was seen that, if W is the weight of the steam in pounds per second flowing into the atmosphere, p the absolute pressure in pounds per square inch in the steam main, and a the area of orifice in square inches, we have

$$W = \frac{pa}{70} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

For steam flowing through an orifice from a higher to a lower pressure where the lower pressure is greater than 58 per cent of the higher, we have the formula

$$W = 1.9\ AK \sqrt{(P - d)d} \quad \ldots\ldots\ldots\ldots (2)$$

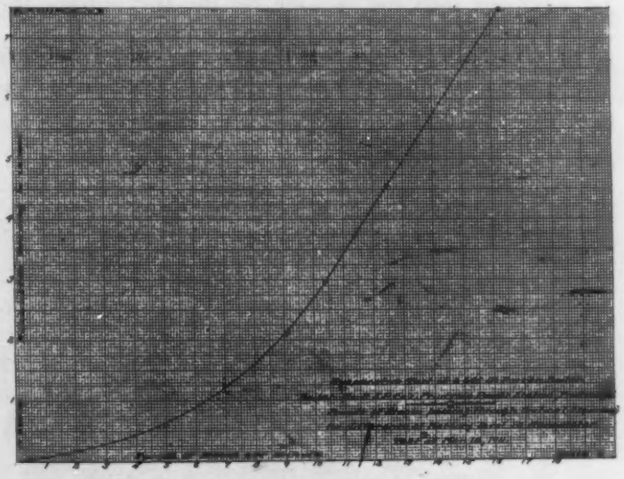
wherein W is the weight of steam as discharged in pounds per minute, A the area of orifice in square inches, P the absolute initial pressure in pounds per square inch, d the difference in pressure between the two sides in pounds per square inch, and K is a constant which has a value of .93 for a short pipe and .63 for a hole in a thin plate or a safety valve.



APPARATUS EMPLOYED IN MEASURING STEAM IN ATOMIZATION

The flow of steam through an orifice wherein a slightly lower pressure is maintained on the further side of the orifice, is found experimentally to be proportional to the difference in mercury heights indicated on the manometer shown on the right in the illustration. By calibrating these readings prior to a test the steam used in atomization may be conveniently and readily determined during a test.

This latter formula is applicable in the measurement of steam to burner utilized in the atomization of fuel oil. In the following lines a method will be outlined setting forth the necessary apparatus involved in determining the variables in the formula. Instead of actually substituting and solving numerically, however, it is far simpler to construct a chart and pick from this the steam consumption for any given steam pressure and pressure difference in an orifice placed in the main.



CALIBRATION OF ORIFICE FOR MEASUREMENT OF STEAM USED IN ATOMIZATION

Previous to a boiler test the manometer which registers the pressure difference at the faces of the orifice is carefully calibrated by condensing the steam flow and weighing the hourly condensate. These data when plotted on a curve as shown above enable the engineer to quickly ascertain the steam used in atomization at any time during a test.

Here then is presented a ready and accurate means of steam measurement for atomization purposes. A diaphragm with an orifice opening of .5 of a square inch in area is inserted in the steam line. On both sides of this diaphragm are drilled holes which are tapped for a ¼-inch pipe. The pipes are then connected to both legs of a manometer filled with mercury. A manometer is nothing more nor less than a U-tube filled with mercury. When these two ends are connected with pipes of varying pressures, the mercury in the U-tube will of course be raised to a higher point in one leg of the U-tube than in the other. The difference in this height represents in inches of mercury the difference in pressure between the two sides of the diaphragm. If now a steam gauge be inserted in the steam main on the boiler side of the diaphragm, we are enabled by means of the atmospheric barometer reading to express these pressures in absolute pressure units as set forth in the chapter on pressures. On the burner side of the steam main a thermometer is inserted as shown in order to measure the temperature of the steam fed to the furnace, as this steam in many instances is superheated and hence the pressure reading does not indicate the temperature existing.

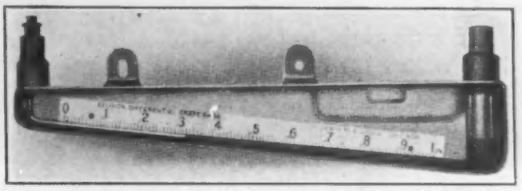
A manometer is accurately calibrated prior to the test by allowing the steam to be discharged into a barrel for a period of time under varying manometer readings. A curve is then plotted similar to the one shown in the illustration, which sets forth the pounds of steam passing per minute for any particular manometer reading in inches of mercury. If, then, readings are taken every fifteen minutes during the test, the testing engineer notes at such intervals the steam that has passed during the preceding fifteen-minute period. In such a manner the total quantity of steam used in atomization is ascertained.

Thus in a test at the Fruitvale Station of the Southern Pacific Company, the pressure of the steam at the burner was found to be 168 pounds per square inch. The temperature of the steam at the burner was 440° F., which indicated a superheated condition of 65° F. The total steam used by the burners for a ten-hour test was found by the above means to be 7441 pounds, while the total weight of water fed to the boilers proved to be 180,240 pounds. Hence the percentage of total water evaporated by the boilers used in atomization is determined by dividing 7441 by 180,240, which is 4.16 per cent.

The total weight of oil fired was 14,093 pounds during the test of ten hours. Hence, the pounds of steam utilized for atomization per pound of oil fired is obtained by dividing 7441 by 14,093, which proves to be 0.528 pounds.

The Taking of Boiler Test Data

In previous articles we have touched upon all the important points involved in tests on boiler economy. These, however, have been considered under separate headings and of necessity in a somewhat disconnected manner. In this and the succeeding papers, we shall endeavor to link these items into a connected unit.



THE DIFFERENTIAL DRAFT GAGE

In order to exaggerate the readings of the draft in inches of water, the measuring tube rests on a slope of ten to one in this type of instrument, and thus readings to another decimal point are ascertained which would otherwise be impossible.

The Object.—"What can you do?" applies equally well to the rating of inanimate objects as well as to the accomplishment of human endeavor. And so the object of boiler testing is to try out the latent steaming qualities of the boiler and test its strength both for sudden calls and for endurance. The manner in which the mechanical design of the boiler can withstand such tests and especially the efficiency with which it can perform its function of transforming the heat energy of the fuel into energy latent in the steam sent forth from the boiler are as a rule the factors that either add lustre to the name of the manufacturer or else relegate the type of steam generator under test to the scrap heap.

The Instructions for Boiler Tests.—The minute details that should be satisfied in order to secure accurate data wherewith to rate the boiler and scientifically set forth its commercial worth are elaborately set forth in instructions issued by the American Society of Mechanical Engineers, compiled by their Committee on Power Tests. In any case of actual test, the steam

engineer should be provided with a copy of these instructions, which he can secure from the secretary of the society by the payment of a small fee.

Since these instructions require many pages wherein to set forth the details of a test, it cannot, of course, be expected that anything beyond a general outline of procedure in boiler testing be set forth in this article. Still it has been the experience of the authors that if the steam engineer gets a thorough picture of the test details as a whole he is well equipped, with the assistance of a nearby copy of the detailed instructions, to properly understand the procedure.

The Test for Efficiency Under Normal Rating.—It has been seen under the subject of Rating of Boilers that the manufacturer or builder rates the output of the boiler on the basis of the boiler heating surface presented to the furnace gases. For each ten square feet of boiler surface so exposed to the furnace gases, the boiler is said to have one boiler horsepower. A test for boiler efficiency under this normal condition of operation is one of the most important to be ascertained in boiler performance. In order to accomplish this result, the steam engineer usually computes the total weight of water the boiler would approximately have to evaporate into steam per hour under the conditions of entering feed-water temperature, boiler pressure, and quality of steam generated to satisfy the builder's rating. Having made a careful estimate of this quantity he then proceeds to operate the boiler as nearly as possible to meet this condition.

Time of Duration of Test.—The generation of steam is maintained as uniformly as possible over a period of from eight to ten hours.

The Beginning and Stopping of a Test.—At the beginning of the test the level of water in the boiler is noted on the water glass and at the completion the water is brought to the same height.

In the testing of boilers fired by fuel oil, the boiler is brought up to and continued at normal operating conditions until the furnace wall and boiler room temperatures are at their normal reading. Then the test is started by feeding weighed water and fuel oil. At the end of the test, all conditions of pressure, temperature and rate of steam generation should be as nearly as possible the same as at the beginning.

The Weighing of the Water.—Several tanks are placed upon carefully calibrated scales and all water entering the boiler from the instant the test starts to its closing point is carefully weighed. The details of the methods involved in the weighing of water have appeared in a previous chapter.

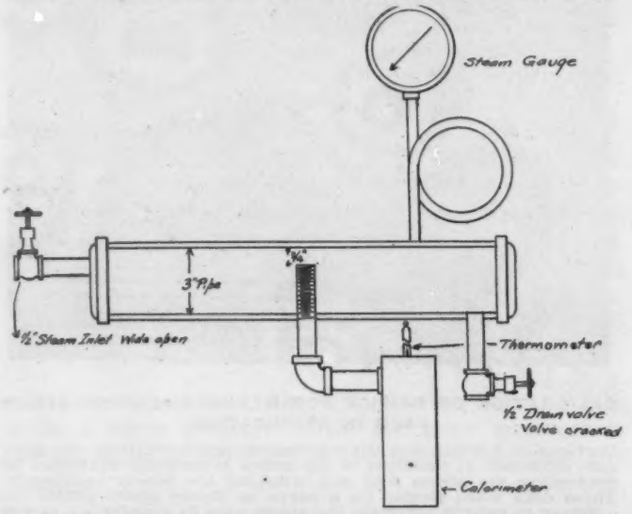
The Heat Represented in the Steam Generated.—The temperature of the entering water and the pressure of the steam generated are noted at frequent intervals. The quality of the steam as to whether it is wet saturated, dry saturated, or superheated, is also carefully determined quantitatively by methods outlined in previous chapters.

With these data at hand the steam engineer is enabled by deductions to be set forth in the article on Heat Balance to compute the actual heat energy absorbed by the entering water in the production of steam.

The Oil, Its Measurement and Analysis.—At the same time that the steam generating functions of the boiler are being ascertained, it is of course necessary to weigh the fuel oil admitted to the furnace for firing purposes and to draw frequent samples for the composite sample to be used in ascertaining the heat producing value of one pound of fuel. The method of weighing the oil and drawing the oil sample has been set forth in a previous chapter.

Having determined the calorific value of one pound of fuel by methods previously described the total heat put into the furnace by the fuel during the test is computed.

In former articles are to be found discussions which fully set forth the methods utilized in determining from the oil sample its calorific value, its moisture content, and its gravity under standard conditions which are necessary to compute the total heat producing value of the oil used in firing the boiler under test.



A SUGGESTION FOR A STEAM CALORIMETER ATTACHMENT
The throttling calorimeter has found wide application as a means for determining the moisture in wet saturated steam in its application in fuel oil practice. Here is a suggestion for the calorimeter attachment in accord with rules laid down by the Power Test Committee of the A. S. M. E.

The Steam Used in Atomization.—In most central station practice wherein fuel oil is consumed for heat generation, the atomization of the fuel oil is accomplished by blowing into the furnace through the oil burner a certain quantity of steam that is being generated in the boiler. To obtain the useful and economic quantity of steam generated by the boiler we should then subtract this steam used in atomization from the total steam generated in the test. A practical method of obtaining experimentally the steam used in atomization has been described in a previous chapter.

The Boiler Efficiency.—Having thus obtained the net heat absorbed by the boiler under test and also the heat given out by the fuel oil sprayed into the furnace, the ratio of the former to the latter gives us the efficiency of the boiler as set forth in the discussion on Heat Balance.

In central station practice on the Pacific Coast the gross boiler efficiency in the best installations ranges from 81 to 83 per cent under test conditions. The atomization of the steam lowers this efficiency by about 2 per cent, thus making the best net boiler efficiencies range between 79 and 81 per cent.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

ELECTRICITY IN MODERN ARCHITECTURE

BY EMMETT D. CHEESMAN

(The enterprising real estate owner not only remodels his old houses by installing electricity, but he builds his new ones with every modern convenience in electrical lighting and heating. It is good business for the apartment house owner, for it means that he will have no difficulty in renting—and it is certainly good busines for the electrical man, from the central station to the contractor-dealer, who is beginning to appreciate that the architect and the real estate man are among his best customers. This interesting description of an electrical apartment house is obtained through the courtesy of the Southern California Edison Company.—The Editor.)

Each day takes us farther away from imitating the varied ideas and creations of other periods. New ideas, shorn of all garnishment and adornment, have brought the realization that simplicity is beauty and that beauty and harmony count for naught when it does not radiate from within us. To this ever-eager spirit of progression and originality and the necessity of practical requirements of modern living conditions we may attribute the electrically equipped home as one of its most artistic and beautiful contributions. Electrical throughout, because as Irving I. Gill, the architect expressed it, it was the only means of adhering to the essential ideas of cleanliness and sanitation of his model construction, the West Adams Villa Apartments of Pasadena.

The refrigerator that operates automatically by electricity is wholesomely sanitary and there are many good features that become available by its introduction into the home.

The influences and expressions of different ages are seen in the styles of architecture men have created. There has been the Greek and the Roman; the architecture of the period of the Renaissance and others, each with its distinctive construction, but these styles of architecture have largely been expressions of art, as the result of the influences of certain schools. Now we are in an age of science; of economy and practical art. Modern science, plus the modern idea of simplicity and the fact that after all, shelter and comfort are the principal purposes of the home, has given us this new style of architecture—the electrically equipped home. So it follows that a Modernist in architecture has departed from the conventional house planning and building and includes the installation of electrical appliances the same as he plans on the installation of plumbing and necessary lighting fixtures.

Mr. Gill, in giving many years to the study of the features of the ideal home, has planned and built seven "homes" of irresistible charm under one roof and made each one perfect in effect of convenience, cleanliness and cheerfulness—wholly livable and homelike. There isn't an old idea to be found in the creation of any of these; everything is new and distinctly different and unquestionably the more beautiful for it. The thought given to the minute details in every instance makes one appreciate it in comparatively the same manner as one would the work of a mechanic and a craftsman.

There are no central fixtures or side brackets in these rooms—all light being furnished by various types of portables which are furnished with the house. Note the electric heater and the glimpse of the electric kitchen in the rear.

He has thought of the part the rooms must take, individually, making them first, bright and cheerful by daylight, using great care that by night their tone shall not be changed. There are portable pedestal electric lamps with indirect lighting, giving the same soft light that the sunlight gives by day. The elimination of chandeliers and side lighting fixtures causes no breaks in the lines of the walls and ceilings. Electrically heated, there are no furnaces to be fired—the turn of a switch gives a radiant healthful warmth, free from poisonous gases, and the air is pure and odorless. The walls being of concrete and the window frames of metal construction as are all of the doors, which are hung on invisible hinges, there is no waste of heat or draughts to chill the rooms. The floors throughout are of a polished sandstone composition

and when finished resemble rich leather with a play of color that is exquisite. Window sills are flush with the walls and baseboards are eliminated, primarily for the dustless idea, but give an unusual charm, forcibly convincing of sanitation. The tone of the walls is finished so as to reflect the color of every object in the room, responding to all the varying lights. Relative harmony in all these unusual features and electricity show the extremes which have been resorted to, to make this a modern structure in the progression of architecture.

Analyzing the electrical possibilities of such a home, one dwells upon the thoroughness and ease the household duties may be discharged. Artistic women find an interest in the arrangement of their homes and now that electricity has made it possible for them to take the actual work from the hands of the servants, the result is that personality and charm become subtle qualities.

Can one imagine a delicate woman, daintily gowned, sweeping great clouds of dust with a broom? Immediately the daintiness and delicateness fades from the mental picture when you think of the broom and dust, but lo! put a vacuum cleaner in the same hands and dignity and charm are enhanced.

Women have their sphere and needlework and sewing is a natural accomplishment to most of them, but without the electric motor attached to the sewing machine, much of the beauty is obliterated through weariness and labor in operating the machine.

What woman is there who wouldn't long for that wonderful kitchen? It seems the longer you are in it, the more you are convinced that it is an electrical wonder! The electric ranges—built into the wall, no dirt to accumulate underneath the stove, no fuel to bring in to litter up the floors, no burnt matches and most of all, no drudgery about preparing a meal, whether for family or for any number of guests. It's all so simple — an automatic clock arrangement will even make it possible for you to cook your meal while you are shopping or visiting. Days of the housewife being busier and fuller than ever before, economy in time is of great import, while the saving in food is a patriotic demand.

Mr. Gill has installed two electrical necessities that need no applause to make them popular; their good points are rapidly grasped. One is the automatic electric water heater — "Everhot" is just what it is —hot water that is hot at the turn of the faucet, without having to think to light the heater an hour before it is to be used. The other is the iceless refrigerator—iceless and icemanless. Electrically operated, no uncertain deliveries or mud to be tracked in by careless deliverymen. Food preservation in a sanitary manner is alone a convincing feature.

The happy, cheerful woman of the home is an acquisition to humanity since housework can be eliminated of long weary hours and drudgery and servants. There is more time to be given to the whims and fancies and work becomes part of the day's pleasure and happiness and health prevail where the strain of the old methods of housekeeping are relics of "olden times."

A PROGRESSIVE CONTRACTOR

Sessions & Grey, electrical contractors in Salt Lake, Utah, won the third prize in the Fan Motor Merchandising Contest of the Western Electric Company. This contest was open to all distributors of Western Electric fans in the United States, and it is interesting to note that Sessions & Grey were the only contractors to win a prize. In addition to an attractive window display, they conducted a systematic and effective local campaign in connection therewith, which coincided with the popular magazine advertising of the Western Electric Company.

That this firm is wide awake and alive to present day conditions is further shown by Mr. Grey's article on the subject of small cottage wiring, which appeared in a recent issue of the Journal of Electricity.

The house is really built around its electrical installations. The kitchen, with its electric stove and electric refrigerator, is the particular pride of the architect.

EFFICIENCY AND RETAIL SELLING

BY ELMA STEINMANN

(It may not have occurred to you that the mere matter of how you make your sales is a thing to be studied, but the comprehensive analysis of the selling problem presented here will suggest possibilities of improvement. Efficiency is within the power of the selling end of the business as well as in the factory. Department stores are taking the subject very seriously—but the question is a no less important one to the small dealer who perhaps has only one or two employees. The problem is essentially the same—to sell goods effectively. The author is Educational Director of the Emporium department store in San Francisco and actively engaged in this work.—The Editor.)

This paragraph from President Wilson's proclamation (April 15, 1916), voices the keynote of the efficiency movement. The elimination of all waste is the end in view, for in the final analysis, waste of any sort is harmful. "Efficiency is attained by the use of the best methods for the achievement of the best ideals." Emerson states as one of his twelve underlying principles of efficiency the necessity for a clear-cut and definite ideal.

The science of management is comparatively new. Some of its principles were discovered and applied by Frederick W. Taylor in the Midvale Steel Works within the last half century.

Many people have a superficial impression that "scientific management is useful only to the factory or perhaps to a railroad, because they have heard of it mainly in connection with those fields. It is true that the manufacturing industries were the first to recognize their problem and have much to teach us. The activities of the factory have been analyzed scientifically in their relation to each other. These activities have then been so organized that the best results may be obtained at the smallest expenditure of time, effort and money."

Both motion studies and standardization of tasks and working conditions are being applied to all fields. Science has just as much to do with selling as it has to do with manufacturing, as many of the selling organizations have recognized.

The selling field may be generally classified as "outside" or wholesale selling, and "inside" or retail selling. There is a primal difference between the two fields. The outside or "traveling" salesman or woman must seek the customer — create the demand. The inside or retail salesperson serves a customer who voluntarily enters the store in a buying frame of mind.

This difference is important, for it is probably the reason for the precedence that the outside selling field has taken. The old-time traveling salesman, whose chief qualification lay in his ability to "crack jokes" and entertain customers, is fast disappearing. Competition is every day becoming keener and the modern dealer, before he gives an order, wants to know facts about the superiority of the article in question, and how it will affect his profits and expenses. For this reason the traveling salesman, too, is studying his problem. He learns all he can about his customer before he approches him. He watches for every clue. He knows his merchandise from A—Z, its power, and superiority, as well as its limitations, and he studies how to adjust this knowledge to the peculiarities of the customer before him.

In the best organizations salesmen are carefully trained before they are allowed to go out to represent their product. There is a standard of service peculiar to each kind of ware and a man's potential ability must be considered before he can be successfully placed.

But there is a leak in the retail business that is persistently continuing. Good business methods in advertising, merchandising, even a perfect store system will not correct it. The old-time "clerk" of the store, too, must be displaced by a trained saleswoman or salesman.

Large retail institutions like department stores, foreseeing this need, are installing departments of training for the sole purpose of applying the principles of efficiency to their activities. Schools, both public and private, are giving courses of study especially designed to meet the requirements of the retail field. A typical course includes the following subjects:

I. Salesmanship, which should cover: 1. Analysis of a sale. This involves: (a) Approach to customer—getting attention; (b) Showing merchandise—arousing interest; (c) Talking up merchandise—awakening desire; and (d) Closing sale—getting decision. Under Salesmanship also come the headings: 2. Type of customers; and: 3. Demonstration sales for discussion.

II. Merchandise. This includes the subjects of: 1. Stock, its classification, arrangement and display, and its care. 2. Materials and qualities; and 3. Color and design, which is applied practically to arrangement and display and proper color combinations.

III. Business administration, which involves: 1. Principles of management. 2. Organization. This divides itself into: Relation between management and employee; relation between employees; and, relation to customers.

IV. Academic Subjects in Business, covering: 1. Arithmetic; 2. English; and, 3. Geography.

Salesmanship is a fine art. Like all arts, a love of work is necessary for its success. Real salesmanship consists in the ability to sell goods that will not come back, to customers who will.

IT IS evident to every thinking man that our industry on the farms, in the shipyards, in the mines, in the factories, must be made more prolific and more efficient than ever, and that they must be more economically managed and better adapted to the particular requirements of our task than they have been; and what I want to say is that the men and the women who devote their thought and their energy to these things will be serving the country and conducting the fight for peace and freedom just as truly and just as effectively as the man on the battlefield or in the trenches.

—Woodrow Wilson.

Western Ideas

EVEN THE BAGGAGE TAGS of Japan are novel and interesting. This attention to detail and distinction in little things is one of the great assets of Japanese business. The customer is impressed with the high quality of the service rendered and subconsciously pleased with an establishment so enterprising—certainly a most fortunate frame of mind for a prospective purchaser. This unique tag from the beautiful Myako Hotel at Kyoto, which in its red, white and black setting is at once impressive and an excellent attention holder. Why not make use of this novel idea and make your package deliveries savor of taste and novelty. It will place your establishment in the purchasing list of many homes you thought impossible to enter. Women particularly are pleased with such details. Not one of them but strives for attractive distinction in her home and her dress—and if she could she would trade only in stores which possessed a taste equal to her own.

Compare this with the ordinary manila baggage tag

MAKING THE BILL ATTRACTIVE is a task not usually attempted, but in so far as it is possible in a world of high costs and low wages, this firm seems to have accomplished it, for in place of the usual severely printed billhead, a hand printed lettering is used which is perfectly legible, but thoroughly in keeping with the high class of trade to which the store caters.

It is an establishment located on the edge of a residence district and has been remarkably successful in building up the "home" side of the business. The neat stationery is but one of the minor opportunities

Louis Levy, Manager — Telephone Prospect 230

LEVY ELECTRIC CO.
1230 POLK ST.
SAN FRANCISCO
EXPERT ELECTRICAL SERVICE

The upper half of this bill is pleasing

for the making of a good impression which the wide-awake store does not miss.

Just in the same way as you judge the personality of your correspondent by the letter paper he uses and the general style of the letter, so the customer is inclined to judge the contractor or dealer by the appearance of the billhead or estimate sheet. If this is carelessly prepared or illegible, unconsciously the record is chalked up against the writer's credit. This store not only fails to make a bad impression with its bills, but has actually succeeded in turning them to its advantage.

UTILIZING THE PUBLIC'S INTEREST aroused by another man's advertising is perfectly legitimate in some cases. The installation of an electric pump, shown here, is part of an exhibit of California farm lands which occupies the display window space of a San Francisco establishment. The device is self-contained, pouring the water out into a miniature irrigation ditch, through which it flows about the model farm patch and returns to be pumped over again. The arrangement is most attractive, an advertisement of the possibilities in oats and alfalfa being borne out by the little patch which is actually planted and sprouting a delicate carpet of green.

The fact that there is almost always a crowd about the window is a good demonstration of the drawing power of moving things. There is a particular fascination about running water which always brings a group of onlookers.

A miniature farm which attracts considerable attention

The moral of the story is in the possibilities of mutual advertising. The lands here brought to the attention of the public would be quite without value except for the possibilities of irrigation, which in turn is dependent largely on electric pumping. The real estate company then regards the pump installation as a most desirable feature of their exhibit, while on the other hand it brings the pump to the attention of prospective buyers in a most favorable way. The idea might well be carried into other lines of electrical apparatus and appliances and advertising extended beyond the store itself into the diversified appeals of other industries.

A STORE LIGHTING CAMPAIGN was effectively carried out by P. B. Alexander of Texas, who tells of its success in a recent number of "How-I-Did-It."

Electrical education, like charity, begins at home. With this in mind, we offered a prize of $15.00 to the school child under fifteen years of age who would submit the best essay of 250 or less words on the subject,

"Why Stores Should be Well Lighted." We advertised this and limited the contest to a certain date.

The writer took charge of the campaign and immediately went to the superintendent of schools and told him of the details of the plan. The scheme pleased him very much and he promised to call our advertisements to the attention of the teachers interested and assign this contest as a theme subject.

After the closing date the nearly two hundred essays were turned over to a chosen committee and the winner was picked. So many of the essays were of such merit, though, that aside from the first prize of $15.00, we created ten extra prizes of one dollar each and gave these to the next ten children.

After the smoke had cleared away we got busy on our list of contestants and the city directory and we picked out those whom we recognized as children of store owners. We found a surprising number of these from which we worked up an excellent mailing list.

The little girl who won the first prize was the daughter of a man who kept a little "neighborhood" store, and in a short while he had replaced his old fly-specked drop cords and bare lamps with neat pendant fixtures and Mazda C lamps, one of which was left burning all night. (His little girl had stressed the burglar protection point in her essay, and I worked it in that way.)

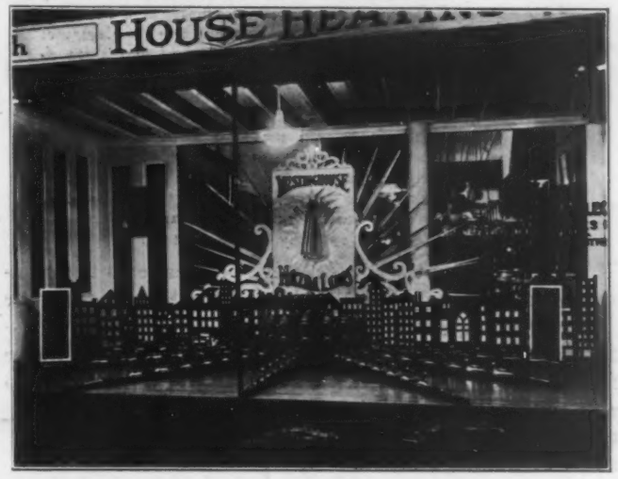
Another contestant proved to be the son of a man who had the only gasoline lighted ladies' furnishing goods store in the city. Ye gods! How we laid it on to him! Sold him? Sure! We sold several others, too, the details of which I won't burden you with here as this is a "wholesale" idea, and we can't deal with specific instances at too great length.

Aside from the actual business we secured from this contest, we made many friends. We brought flocks of our future customers to our office, thereby giving them a chance to become acquainted with us long before they would be called upon to deal with us. The ice is broken and in any future activity that we may plan, we can count on the interest of, at least, the school children. That's a whole lot, too.

We made the business men believe what we were talking about because their own children and their friends' children looked up facts about lighting and found them to be the same as we had been propounding.

THE STORE WITH ATTRACTIVE WINDOWS, is the way one customer was heard to describe the Gas and Electric Appliance Company of San Francisco. Surely the present example shown in the accompanying picture is an instance of it. The window is a clever combination of irons, toasters and lamps, combined effectively so that there is no appearance of crowding and no thought but that the display is unified. Indeed, the great beauty of the exhibit is in the single impression which it makes.

The value of making a picture of your window is here fully appreciated—and it is interesting to note that the public is struck by the result and usually stops in passing this display and looks into the matter in detail. Aside from those customers bent on a deliberate purchase who would enter a store in any case, much of the trade which comes to an establishment comes because of some former impression which has been made on the customer's mind. In this respect a show window is exactly like a billboard or other advertisement with the advantage of three dimensions. And exactly the same factors which go to make these



A window the passer-by remembers

other advertisements successful, mark the drawing qualities of such an exhibit. It is recognized that an artistic poster or a well designed newspaper ad, with distinctive type and composition, are objects to be desired—just so are beauty in color and line, the elements with which a window display is built. Note how women—and men, too—will group about a window remarkable for its beauty in other lines of merchandising than your own. They may not purchase what is in the window any more than you are stimulated by the ads in the street cars to at once buy yourself a certain brand of collars—but they remember the store just as you remember the collars or chewing gum, and they look it up at a later date when they happen to need its type of ware.

A MOVING NUMBER calls the attention of the passer-by to the store of A. E. Wells Company, of 78 Second street, San Francisco. This effective number in raised gold against a background of black is eccentrically mounted on a rotating shaft so that the entire disc describes a slow convolution, remaining, however, always in an upright position. The store is conveniently located on a busy street, where the passers-by have an excellent opportunity to have their attention attracted. The conception is a particularly good one, for the notice is called not only to the store, but the number itself is emphasized in the mind, so that it becomes a part of the odds and ends of information upon which the average person draws in governing their lives, from deciding on a moral question to determining where to go to have their house wired. And to have this person recollect "that store at 78 Second"—is surely an end to be desired.

It moves!

THE ARCHITECT AND THE ELECTRICAL MAN

BY H. P. PITTS

(It is an acknowledged fact that upon the original wiring of a house and the provision for base outlets and the like, depends to a great extent the subsequent use of electrical appliances in that home. From the electrical man's standpoint, it is essential that the architect, who has so much to do with planning homes, should know what can and cannot be done along electrical lines—and the architect himself welcomes information which will be of value to his client. This suggestion of mutual helpfulness was made at a recent joint meeting of architects and electrical men at the San Francisco Electrical Development League. The author is of the industrial engineering staff of the Pacific Gas & Electric Company.—The Editor.)

The idea that we have, with reference to the relations between the architect and his client, is that the former is requested by the latter to produce satisfactory plans and specifications for a building—a home for instance. The next move is to put these into reality, seeing to it that every detail is lived up to by the contractor, and that the building is turned over to the owner in perfect detail—presto—it is expected that when the home is first occupied by the owner there shall be nothing lacking in comfort, view, surroundings and conveniences. This is the architect's business and is what he is spending time, patience and money upon, and, as these three items are the only real ones that are worth while saving these days (outside of food), it is essential that he look for assistance in every possible direction.

WHERE THE ELECTRICAL MAN COULD HELP THE ARCHITECT

Proper location of meters and switchboards
Convenience to central station poles.
Engineering elements of good lighting.
Provision for later use of appliances.

In the designing of a home, it must be a puzzle to determine which features shall be the most important, and whether or not one has to be sacrificed to accommodate another. The location of certain rooms with relation to one another may interfere with the electrical features, in that it may cause the meter and switchboard location to be placed at a point directly contrary to where it might be advisable to bring in the wires for lighting and power. Experience tells us that this one feature could be greatly improved upon, and that had the architect discussed this apparently simply matter with the contract manager of the central station, information would have been furnished which would have not only saved unnecessary expense, but would have made smooth sailing for the electrical contractor, whose business it is to live up to specifications. This is a very vital matter, and it should not be presumed from the mere fact that there is a pole standing in front of the premises that it is a central station pole; it might be a telephone pole, or again, might not be the pole from which the energy could be conveniently taken. A great deal of this trouble has been fought out between the central station and the electrical contractor, when all controversy might have been eliminated had the former's representative been called in when the specifications were being prepared. Particularly is this true with reference to underground services.

Within the house the matter of good illumination is of very vital importance, probably not so apparent to those who stay at home all day, and who compliment the architect on the arrangement of the rooms and other conditions to make the view most enchanting, as to the one who leaves the house in the morning before the view is apparent, and who arrives home after the view has faded. Mostly, what he sees of his beautiful home is what the lighting effects give it. His temperament should be studied and considered, and the central stations have provided means whereby the best information may be given as to good lighting.

Electric apparatus within the house: It has come to be generally agreed that baseboard sockets distributed about the house are as essential as that the house should be wired for lighting. The conveniences of labor saving electrical devices are today solving many a former serious household problem. The cost of household labor, together with the scarcity of it, is driving many people from good homes to the congested apartment houses. Were outlets properly placed in all modern homes, not only would their presence suggest the purchase and sale of labor saving electrical devices to a greater degree, but would encourage the housewife to attempt her work in her own home. Carefully prepared statistics disclose the fact that in San Francisco in the past year, hundreds of homes have been abandoned for apartment houses, and a survey of these vacant houses discloses the fact that there was no provision for attaching plugs for electrical heating devices, vacuum cleaners, washing machines and food preparing appliances, etc. People simply could not get help, and rather than drudge, they took the next best means of existence, that of giving up their otherwise comfortable homes for the apartment houses. The lesson to be learned from the conditions are obvious, and need not be elaborated upon further.

Now then, a word to the central station representative. You are anxious to get in touch with the architect, you would like to be his friend because you can be of mutual benefit to each other. However, you must not think that you are at liberty to rush into his office at any time of the day and demand an audience, for he is a busy man, not busy in the sense that a restaurant man may be when lunch is being served, but, being an artist, his mind has to be concentrated on very artistic matters and must not be disturbed. It is necessary, however, that he have his business hours, and if you can make your subject interesting enough he will have a certain hour during the day that he will see you, particularly if you can convince him that he needs you, and it must be apparent to you that with all of the material that you have at your command, you can make yourself welcome.

Indeed, this closer spirit of co-operative helpfulness now so closely engendered among all branches of the electrical industry may well be extended to the architect and his labors. In this broadened sphere of helpfulness great good must be the inevitable outcome.

UTAH'S OLDEST ELECTRICAL CONTRACTOR

BY GOLDEN J. GUIVER

(A unique installation which involved the drilling of granite walls in some places seven feet thick in order to run the wires, was the achievement of the gentleman shown here two hundred feet above the ground. The fact that this construction was the work of the man who obtained the first contract for electrical work in the state of Utah is of particular interest. The author is a prominent contractor-dealer of Salt Lake City.—The Editor.)

This is a photo of the top of the northeast tower of the Salt Lake Temple, looking north; height of tower, 200 feet—showing the finial made entirely of copper, supporting eight 100 candlepower lamps. The person on the ball is E. G. Holding, who had charge of installing all the electric work in the Temple, which is built entirely of Utah granite, and was forty years in course of construction. The granite walls, whose thickness was from four to seven feet, had to be drilled to make way for the wires.

Two hundred feet above ground

Mr. Holding is the oldest electric contractor in the state of Utah. In January, 1881, he was the first one engaged by the Utah Telephone Company to put in an exchange in Salt Lake City. Work was started the first Monday in February of that year, and the exchange was started with seventy-five subscribers in the early part of April. (Salt Lake City exchange now has about 23,000 instruments in use.) The "central" consisted of a small room about 8 by 10, partitioned off the Western Union Telegraph office, and the equipment consisted of two 50 wire Gilliland switchboards.

During the spring of 1881, he was loaned by the telephone company to the Salt Lake City Light & Heating Company, for the purpose of putting in the first circuits for the first lighting plant in Utah, which consisted of four Brush arc machines of 40 light each.

In the spring of 1887, he branched out for himself and opened the first electric shop between Denver and San Francisco, and has conducted an electrical contracting business ever since.

The population of Salt Lake City in 1870 was about 20,000; today it is estimated at over 140,000.

This city enjoys the distinction of being the largest consumer of electricity in the world, according to population, there being 99% connected with the services of the Utah Power & Light Company.

WORDING A TELEGRAM

The importance of wording your order so that it may be easily understood, no matter where the telegraph operator places the period, is often underestimated. The result of such failure is interestingly told by W. H. Brommage in a recent number of the Pacific Telephone Magazine.

A telegraph operator at San Francisco telephoned the superintendent of supplies that she had a telegram and gave it just as it appears here:

"Need at once for estimate number fifteen sixty eight fifty two piece transposition brackets. Have applied all available this division none on hand—division please have expressed to ——— care of Western Electric Company use requisition ——— if needed advise."

This is how the stenographer interpreted the message, and after reading it back to the telegraph operator, received the O. K.:

"Need at once for estimate No. 1560—850 2 piece transposition brackets. Have applied all available this division. None on hand ——— division. Please have expressed to ——— care of Western Electric Company. Use requisition ——— if needed. Advise."

This interpretation seemed to be very clear except that the quantity of brackets seemed unusually large. However, as an express shipment was desired, everything pointed to a rush job that needed prompt action from all concerned. Commencing with the sending of the telegram until the matter was finally completed, this is what took place:

1. Telegram from originating division office "A" to superintendent of supplies;
2. Telegraph operator San Francisco transmitted the message by telephone to supply department;
3. Supply department telephoned Western Electric Company to ascertain stock conditions;
4. Western Electric Company telephoned supply department, none on hand—stock due next month;
5. Telegram from supply department to division office "B" asking if brackets could be supplied;
6. Telegram from division office "B" to supply department, advising none available.
7. Supply department telephoned to division office "C" to ascertain if any brackets available, what quantity, and where located;
8. Division office "C" telephoned to supply department that a quantity of material could be furnished from several points;
9. Supply department telephoned to division office "C" to arrange for shipment of 265 brackets from three exchanges;
10. Long distance telephone from division office "C" to district superintendent to arrange for shipment;
11. District superintendent telephoned district plant chief to arrange for shipment from various points;
12. Supply department telegraphed to division office "A"—"Your message today. We have arranged to ship by express a total of 265 2-piece transposition brackets from points ——— division. May be able to obtain some from ——— division. If not will have them made locally and advise you by wire Monday";
13. Telegram from division office "A" to supply department—"Your message shows 265 transposition brackets. All we want is 50 and our telegram must have been incorrectly transmitted."
14. Supply department telephoned division office "C" to countermand previous instructions and ship only 50 brackets from one exchange;
15. Long distance telephone from division office "C" to district superintendent to cancel previous instructions and only ship 50 brackets;
16. District office telephoned district plant chief accordingly.

Arrangements had been made to ship 265 2-piece transposition brackets from three points by express

instead of a total of 50 brackets which were required, and this would not have been necessary had the original telegram been properly worded so that the figures representing one item were separated by a word from figures referring to another item. If the telegram from the Division Office "A" under paragraph 13 had not been dispatched promptly the instructions given under paragraph 9 would have been followed and a quantity of brackets in excess of the requirements would have gone forward by express thereby constituting an overstock at that particular point; the result being—

1. Necessity of finding some other job where they could be used, or

2. Necessity of notifying other divisions that these brackets were available at a certain point and arrange to order them on other requisitions;

3. The possibility of shipping them back to the points from which they were originally ordered;

4. Additional expense.

It can readily be seen that much labor, time and expense could have been avoided if a little forethought had been given to the composition of the original message and as to how it would be translated at the receiving point. The message would have been clearer had it been as follows:

"Need at once, fifty transposition brackets, two piece, estimate number fifteen sixty eight, etc."

ELECTRICAL INSPECTION

BY E. F. DUNLAP

(Portland has a record of very high class work in electrical installations—which may be said to be due largely to the effective inspection system. The details of this work in the field and in the office are here given by a man who is at the head of the inspection department. This interesting article covers the subject matter of a recent paper read before a Northwest convention of contractors and dealers.—The Editor.)

System is needed in the office as well as in the field. By some who are not in a position to judge, this is known as "red tape." The records of inspection must be complete. The filing system must be simple but accurate, so that a record or report of inspection of any installation may be found quickly and thus result in a saving of time, which is a very important factor. The work must be handled in such a manner that the maximum of results may be obtained with a minimum of time. A system must be used by which uncompleted work and also installations on which corrections are pending may be easily kept track of. In support of the system used in Portland, I will say that during the five years which have elapsed since the organization of the department nearly 35,000 permits have been issued, of which probably 400 are still in what is known as the live files. Many of these no doubt have been completed, but this office has not been notified for reinspection.

Another feature of our ordinance which has assisted us a great deal in securing a high standard of installation is the licensing of contractors and supervising electricians. Thus we are able to place the responsibility for defective work and secure its correction in the shortest possible space of time. Every permit except an owner's must be countersigned by some electrician who has had at least four years' experience. Thus we are enabled to obtain a better quality of work than any city which it has been our privilege to investigate. A very high tribute was recently paid to the wiremen of the city of Portland when an inspector of the National Board of Fire Underwriters engaged in resurvey work visited Portland, and the writer had the pleasure of showing him some installations chosen at random, both conduit, knob and tube work. The inspector stated that it was the best work he had ever seen. The need of having all work done under the direction of experienced persons has become so apparent that many cities and even some states are requiring all electricians to pass an examination as to fitness and qualifications. An amendment to the ordinance of the city of Portland is pending which will require all persons hereafter applying for a license as supervising electrician to pass a satisfactory examination before a board of examiners composed wholly of electrical men. Electrical contracting is being looked upon more day after day as a profession, and there is no reason, therefore, why the persons engaged in the work should not be required to possess the necessary qualifications and be licensed.

With the routine of our work many of the contractors are familiar. For the benefit of those who may not be acquainted with our system, I will make a few explanations. In making application for a permit, the applicant is required to fill out a blank giving the address, by street and number, of the installation, the class of work to be done and the number of outlets, switches, motors or other work. This information is all written on a card suitable for filing, and given to the inspectors in each district, who file them by permit number until a call for inspection is received. As this card gives all the necessary information, he takes it with him to the job, and as the inspection is made, a complete record of the job is written thereon. If the work is ready for covering, a small white label is filled out giving the lathers or carpenters permission to cover. This is pasted in the cabinet box. Many of the lathers have found to their complete satisfaction that they are not allowed to cover until this permission has been given. When final inspection is made, a blue label approving the installation for service is filled out and also placed in the cabinet box. This is permission to the service companies to connect.

A method of facilitating service has recently been adopted whereby the service companies run their drops, install the meter and then seal the main line switch open with the seal of the company with a card attached, warning all persons against breaking the seal and giving service before the inspector has given his approval. Upon making final inspection the city inspector breaks the seal, gives service and returns the tag to the company which is notice to them that service has been given. Another advantage of this arrangement is that it gives current so that the inspector can test for continuity.

When a card for an installation is given final approval, it is filed away in the permanent file by street number, which has been checked for accuracy by the inspector at his first visit. Many incorrect addresses are given on the application. This frequently results in a loss of time of at least one day in making the inspection. The contractors are realizing this and we are pleased to state that the number of improper addresses is getting fewer as the necesity is realized.

Technical Hints

BY GEORGE A. SCHNEIDER

(Practical information which will help the contractor-dealer to meet the emergencies of his business and to better his trade is here given in these three articles by a man who is in constant touch with the actual problem. A suggestion for better installations in kitchens and bathrooms which will eliminate the possibility of accidents from faulty insulation is a matter which deserves particular attention as making for the greater confidence of the public in electrical appliances. The elements which should be considered in the selection of the type of speed regulator and the considerations which govern the substitution of bell ringing transformers for batteries with interior telephone systems are further analyzed.—The Editor.)

NOTES ON SPEED REGULATORS FOR DIRECT AND ALTERNATING CURRENT MOTORS—I

When selecting speed regulators for shunt or compound direct-current motors in which the speed changes are effected by inserting resistance in the armature circuit or for slip-ring type polyphase motors, it is necessary to carefully study the operating characteristics of the machine or apparatus to be driven by the motor, otherwise the regulators will not give the necessary range of speed control. These regulators may be of the machine duty or fan duty type, depending upon the service. The difference between the two types of regulators is in the carrying capacity and total resistance of the resistors which form a part of the regulators.

The constant torque resistor, formerly termed the machine duty resistor, is a resistor for use in the armature or rotor circuit of a motor where the current remains practically constant throughout the entire speed range. This means that the horsepower output of the motor decreases directly with the speed as in the case of a motor driving a plunger pump. In this case the torque and therefore the armature or rotor current will remain practically constant over the entire speed range. Here the work done by the motor at one-half speed is one-half that done at full speed.

Machine duty or constant torque controllers are usually designed to reduce the speed of the motor 50 per cent from normal with full load torque on the motor; that is, when the motor is fully loaded at normal speed.

A fan duty resistor is one for use in the armature or rotor circuit of a motor where the current is approximately proportional to the speed of the motor. For example, a fan driven at one-half its normal speed requires less than one-half as much torque as it would require running at its normal speed, and the work done by the motor will be less than one-quarter of that done at normal speed.

Fan duty resistors are generally designed with sufficient resistance to reduce the motor speed 50 per cent with the motor operated at one-half full load current.

The term machine duty does not necessarily mean that any motor for driving a machine should have a machine duty resistor when speed control is to be effected by resistance in the armature or rotor circuit. For example, fan type regulators will operate successfully with motors driving small job printing presses, ice cream freezers, centrifugal pumps, certain types of mangles and similar machines. Primarily, however, these regulators are designed for use with motors driving ventilating fans or blowers with similar characteristics. The two types of regulating resistors are laid out very differently in ohmic value and current carrying capacity, and therefore cannot be used interchangeably.

In selecting regulating rheostats for shunt or compound motors to give both armature and field control, it is also necessary to ascertain the nature of the load and select the resistors for either machine or fan duty accordingly, in order that the proper amount of resistance of the correct carrying capacity will be supplied for the armature circuit. The amount of resistance and its capacity for the field current will be the same for either kind of service.

With shunt or compound motors it is customary to furnish the resistors suitable for continuous duty without excessive heating. However, in connection with slip-ring motors, in sizes about 5 horsepower and larger, it is the practice to select the resistors for starting duty, crane or hoist duty, or continuous or regulating duty. In the smaller sizes there is very little difference in the cost of the different resistors and it is customary to design them for continuous duty and use them for any purpose so long as the amount of resistance is correct. In any case the resistance must be selected either for machine or fan duty.

The difference in resistors for starting, crane or hoist and regulating duty is of course in the carrying capacity; the regulating resistors being designed for continuous service at full capacity.

It should be noted with motors controlled by machine duty regulators that if less than full load torque is developed, the speed reduction will be correspondingly less. In other words, the amount of speed reduction secured will depend upon the current and, therefore, the torque, and the amount of resistance in the circuit. This applies to both machine and fan duty regulators.

It is also well to remember that speed reduction obtained by armature or rotor resistance is a wasteful method; the efficiency of the motor falling off as the speed is reduced.

Careful observation of these points will help to eliminate many of the misunderstandings and delays in connection with orders or installations involving this sort of control apparatus and equipment.

BELL RINGING TRANSFORMERS FOR INTERIOR TELEPHONE SYSTEMS—II

In the article on interior telephone systems in the August 15th issue of the Journal of Electricity, it was pointed out that battery troubles are usually the most common in connection with these telephone systems or similar signal systems, not because the battery is necessarily the weakest part of the system, but because the battery is the part most likely to be affected by any defects in the wiring or instruments that would cause a short circuit or continual drain from the batteries. The number of cells of battery required for a telephone system is very small. When the correct number of cells is supplied and when properly installed in a cool, dry place, a set of batteries will last many months in ordinary service. On the contrary, when the batteries run down rapidly and the transmission is

quickly affected, it is almost a sure sign that there is either a wrong connection or short circuit that is causing the battery to run down, either due to a repeated heavy current discharge from time to time, or a continuous flow of current of small value such as would be experienced in connection with a high-resistance leak between wires or the equivalent.

In several cases of battery trouble on interior telephone systems which have been brought to the writer's attention, an attempt has been made to eliminate the troubles by replacing the batteries with a bell-ringing transformer. The results to be obtained by this change will depend entirely upon the cause of the trouble, the nature of the system and the circuit connections. Some interior telephone systems require only one set of batteries, while others require two

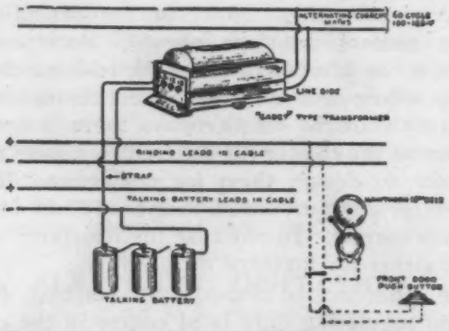


Fig. 1.—Connections showing use of bell-ringing transformer for ringing inter-phone bells and door-bells. Dotted lines show wiring for door-bell using same source of ringing current.

sets. Further, if a door opener is used as an accessory to the telephone system, usually a third set of batteries is needed for the opener. In the single battery system, the same battery furnishes both ringing and talking current and it is, of course, impossible to use bell-ringing transformers, because the talking circuits must be supplied with direct current. Where a separate ringing and talking battery is needed, it is possible in some systems to replace the ringing battery by a bell-ringing transformer. Before this is done, however, it is a good plan to consult the manufacturer of the telephone apparatus to determine if the particular equipment can be operated from a transformer without creating a disturbance in the system.

The connections for a bell-ringing transformer as used in one well-known interior telephone system, are shown in Fig. 1. Here it will be noticed, the system has a separate set of ringing and talking leads, so there is no danger of disturbance. This particular system gives selective talking and selective ringing. It is possible to hold as many conversations at one time as there are pairs of telephones; likewise, any one station may signal another without disturbing other stations.

In this diagram a circuit is shown for a separate bell or door opener. Whether or not either will operate on the transformer current will depend entirely on the design and size. Generally well designed direct current bells in sizes up to and including the four-inch size, will operate fairly well from a bell-ringing transformer, provided the transformer is of sufficient capacity.

Some door openers will not work on alternating current at all, but there are types that will give good service. It is also sometimes possible to greatly improve the operation of some door openers by connecting the coils in parallel instead of series, as they are usually sent out from the factory.

When it is known beforehand that a bell-ringing transformer may be used with the system, it is better, of course, to select bells and openers especially made for alternating current circuits.

An article dealing with bells and bell-ringing transformers will be published in this department in the near future. It will include the very latest information on alternating current bells and method of determining the proper size transformer to supply them.

WIRING IMPROVEMENTS IN THE HOME—III

In several sections of the country more attention is now being given towards making better and safer electric installations in kitchens, bathrooms, pantries and similar rooms in the home. This is a matter which will warrant some study in almost every locality, because too often in these rooms very little effort is put forth to make the illumination most effective and the installation as safe as it might be made with but very little additional expense.

In such rooms, fixtures, switches or wall receptacles are frequently placed in such a position that it is possible for a person to reach them at the same time they are in contact with other house fixtures such as faucets, sinks, bathtubs or the like that are grounded. Here lies the danger in such installations. If the insulation becomes weakened or broken down, there is danger of a shock or burned fingers. Shocks received in this way on the ordinary 110-volt lighting circuit do not often cause a fatality, but are exceedingly unpleasant and likely to militate against the most general use of electrical appliances in the home. But it is not only in the home that these oversights in such installations are always found. They are also common in public places. The writer has been in at least a dozen large hotels where a bracket was located directly above and within reaching distance of the wash-bowl and faucets.

Perhaps the greatest menace is the brass shell key socket. This is a point of control, and as such is presumed to be perfectly safe to handle. However, one has no assurance that the shell is not connected with the ungrounded side of the circuit. The brass shell socket, while very excellent in its place, is not the best enclosing medium for sockets used in such installations as are here mentioned when of the key type. When used they should be of the pull-chain type, and each chain should be fitted with a suitable insulator, but it is better and safer to use porcelain sockets. Porcelain sockets should also always be used in basements or laundry rooms where the floor is likely to be damp. In some cities this is mandatory.

Further improvements can be made by more carefully arranging the fixtures and by a more general use of switches.

The electrical contractor-dealer is in a position to do much excellent work towards such improvements in these installations, and should always take every oportunity to point them out.

WHAT WESTERN INVENTORS ARE DOING

BY H. G. PROST AND WM. K. WHITE

(Suppose you discover that another man is manufacturing the article which you have patented—have you a right to stop him? What damages you can collect and how you must go about it are explained in the article of this issue. If you are accused of infringing someone else's patent, on the other hand—the conditions under which you may maintain your position are here pointed out. The authors are well-known patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

Protection of Patent Rights

The manufacture, sale or use of a patented device, without the consent of the owner of the patent, constitutes an infringement of the patent. The United States courts have exclusive jurisdiction of all suits brought for the infringement of patents.

The United States is divided into nine circuits, in each of which there is a Circuit Court of Appeals. Each circuit is divided into a number of districts, in each of which there is a District Court.

An infringement suit must be brought in the District Court for the district in which the defendant resides, or any district in which the defendant has committed an act of infringement and has a regular and established place of business. In the latter case, service of process may be made upon the agent having charge of the defendant's business in such district.

From the decision of any District Court, the losing party may appeal to the Circuit Court of Appeals for the circuit in which the District Court is located. In patent cases the decision of a Circuit Court of Appeals is, with certain exceptions, final. In some exceptional cases, the controversy may be carried to the Supreme Court of the United States at Washington, D. C.

In suing for the infringement of his patent, the owner thereof may either bring an action at law or a suit in equity. In an action at law, which is tried before a jury, the patent owner can recover only the damages suffered by him by reason of the defendant's infringing acts. In a suit in equity, which is tried by a judge alone, the patent owner may recover either the damages suffered by himself or the profits made by the defendant by reason of the latter's infringing acts. In such an equity suit, the patent owner may also obtain an injunction restraining the defendant from making, selling or using the patented device.

Patent owners should give notice to the public that their articles are patented, either by fixing thereon the word "patented," together with the day and year the patent was granted, or when, from the character of the article, this cannot be done, by attaching to it, or to the package containing one or more of them, a label bearing a like notice. If the articles are not so marked, no damages can be recovered except for infringements committed after the actual notice of the patent has been given to the infringer. However, the failure to mark the articles with such a notice does not affect the patent owner's right to an injunction restraining further infringing acts.

It is an offense to mark an unpatented article "patented," and the law provides a penalty of not less than one hundred dollars for each offense, one-half of the penalty to go to the person who shall sue for the same and the other half to the use of the United States. However, after the filing of an application for a patent on an article, it is proper to mark thereon the words "patent applied for."

The basis for computing damages in an infringement suit varies according to the facts. Where the patent owner has exercised his patent rights by granting licenses to others, the established royalty per article collected by him from his licensees may be used as the measure of his damages for the unlicensed manufacture or sale of his patented article. When there is no established rate of royalty, the measure of damages may be based on a showing that the patent owner would have made the sales if the infringer had not, and then computing the profits the patent owner would have made by making such sales. As his measure of damages, the patent owner may also show that, by reason of the infringing sales, he was compelled to reduce the prices charged for his own articles and, therefore, lost profits to the amount of such reduction. In some cases, the damages recoverable may be based on proof of what would be a reasonable royalty to charge for the making of the patented article.

As a general rule, an injunction in a patent infringement suit will not be granted until after the case is tried and a decision rendered in favor of the patent owner. However, after a patent is adjudged valid in some suit brought for the infringement thereof, it is then customary, in any subsequent suit against another infringer, for the court to grant a preliminary injunction before the trial of the case. The motion, for such a preliminary injunction, is heard upon affidavits setting forth the necessary facts.

Defenses

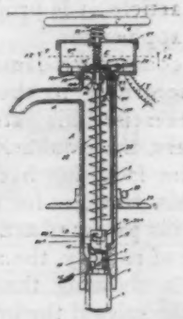
The defendant, in an infringement suit, may attack the validity of the patent, as well as deny the charge of infringement. Among the various defenses that may be relied on, the following are specially provided for by the United States statutes, to-wit: First, that for the purpose of deceiving the public, the description and specification filed by the patentee in the Patent Office was made to contain less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect; or, Second, that the patentee had surresptitiously or unjustly obtained the patent for that which was in fact invented by another, who was using reasonable diligence in adapting and perfecting the same; or, Third, that the patented invention had been patented or described in some printed publication prior to the patentee's supposed invention thereof, or more than two years prior to his application for the patent in suit; or, Fourth, that the patentee was not the original inventor of the

invention covered by the patent in suit; or, Fifth, that the patented invention was in public use or on sale in the United States for more than two years before the filing of the application for the patent, or had been abandoned by the patentee to the public.

NEW IDEAS FROM THE WEST

Electric Water Heater

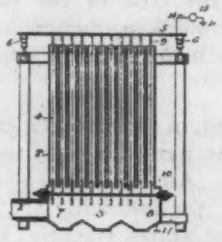
Patent No. 1,252,661, issued to Howard K. Clover of Los Angeles, California, and assigned to the Electrical Products Corporation of Wilmington, Delaware, discloses a novel form of electrical water heater. This heater comprises a vertical tube having an outlet spout at its upper end and an inlet at its lower end. The flow of water into the tube is controlled by a valve seated on the inlet opening and connected to a



stem extending through and projecting through the top of the casing, where it is provided with a handle. A heating element surrounds the valve stem and is connected to switch contacts arranged in a casing above the tube, the switch being arranged so that it is closed when the handle is turned to open the valve. The feature of the construction is the arrangement of the switch and heating coil around the valve stem, so that for the purpose of repair the valve and the heating coil are removable from the tube at the same time.

Apparatus for the Electrical Separation of Suspended Particles from Gases

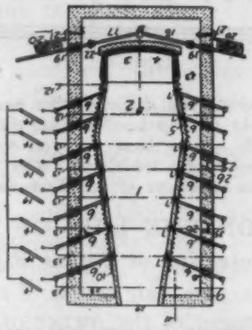
Patent No. 1,252,183, issued to Walter A. Schmidt and George C. Roberts, of Los Angeles, California, and assigned to the International Precipitation Company of Los Angeles, shows an apparatus for electrically separating suspended particles from gases. The apparatus consists of a header provided with a gas inlet and having a plurality of vertically extending open-end pipes connected to the header, the pipes



forming collecting electrodes. Extending axially through each pipe and insulated therefrom is a filament which forms the ionizing electrode. The ionizing electrode extends beyond the ends of the pipes and is provided with an enlargement adjacent each pipe end, so that its surface field intensity is reduced at those points. The gas is introduced into the header and passes upward through the pipes, wherein the suspended particles are separated from the gas and driven against the surfaces of the pipes.

Electric Ore Furnace

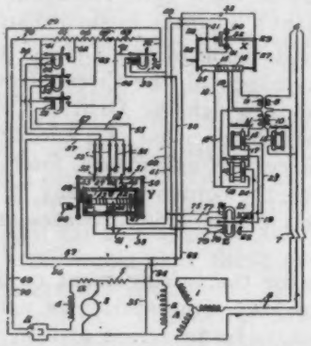
Patent No. 1,252,635, issued to John A. Ward of Spokane, Washington, discloses a novel form of electric ore furnace and a novel method of controlling the flow of current through the heating element. The furnace is heated by the flow of current through a heating coil surrounding the furnace and the current through the heating coil is controlled by a pair of adjustable arc forming electrodes in the circuit which are arranged exterior to the heater itself so that they have inde-



pendent heat radiating properties. A plurality of electrodes extend through the furnace wall into contact with the ore contained in the furnace for the purpose of producing arcs within the furnace, and a switch is arranged to divert the current from the heating coil to the electrodes, the switch being constructed so that it closes the circuit through the electrodes and the body of ore before it opens the circuit through the heating coil.

Voltage Regulator

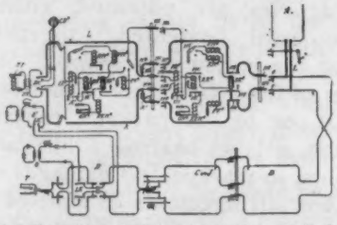
Patent No. 1,252,451, issued to Charles H. Kicklighter of Pasadena, California, and assigned to Westinghouse Electric and Manufacturing Company, discloces an improved form of voltage regulator for a dynamo-electric machine. The regulator consists of co-operating contact members, an actuating



winding therefor energized from the circuit of the machine, an impedance in circuit with said winding, and a relay mechanism controlled by the contact members for governing the field excitation of the dynamo-electric machine, and the value of the impedance in circuit with the actuated winding.

Telephone System

Patent No. 1,251,350, issued to Gerald Deakin of San Francisco, California, and assigned to the Kellogg Switchboard and Supply Company of Chicago, discloses a telephone system involving the use of link circuits and automatic switches. The system comprises telephone lines, operator



controlled link circuits and automatic switches for interchangeably connecting the lines and link circuits responsive to calls over the lines. The lines are provided with connection terminals and operator controlled automatic switches are provided for connecting to the terminals of a calling line and one of the link circuits while the receiver is removed at the calling sub-station.

SPARKS—Current Facts, Figures and Fancy

(Twenty-two thousand dollars a year from scrap metal rescued from the junk heap is not a bad record to emulate. Other examples of efficiency which might well be followed are those of the safety film which shows the workman what may happen and what he should do if it does, and the report of a new German power plant which is run on waste products alone. A report is further given of what is thought to be the highest telephone line in the world.—The Editor.)

The palm for "moderate millionaires" is to be given to America, which has the greatest number of fortunes from twenty-five millions down. In the higher ranks, however, the United States is surpassed by England, who has 79 payers of income tax on one hundred millions, whereas we have but nine.

* * *

Engineers of the Mountain States Telephone & Telegraph Company have installed what they believe to be the highest telephone service line in the world, with the possible exception of the Cerro de Pasco line in Peru. On the Denver-Leadville toll route the company has constructed the section of the line that crosses Argentine Pass at an altitude of 13,200 feet.

* * *

The new power house of the large railroad station that has just been completed in Frankfort on the Main, Germany, is the first large railroad power station in the world to be operated entirely on cinders taken from the locomotives. These cinders, according to the Frankfurter Zeitung, are piled in heaps from which an electric traveling crane runs directly to the boiler room.

* * *

Saving from the junk pile is clear gain. Odds and ends of metal thrown into the salvage bins of the Southern Pacific in 1917, brought a return to the company of $22,000. Even the oil used to lubricate the machinery and the cuttings of the steel and iron castings is salvaged. It is reclaimed from the drip pans under every lathe and journal and bearing in the great shops. And now they are making ink out of the stub ends of indelible lead pencils.

* * *

The traffic congestion is not confined to the railroads—telegraph lines have been badly overcrowded for several months, according to the superintendent of telegraph of one the western railroads. War committee messages, freight tracing, and excessive trade messages have added greatly to the burden of the lines. If one word per message per day were eliminated, it would mean a saving of thousands of words—almost enough to relieve the overload.

* * *

Moving pictures showing typical accidents in the logging industry and how to prevent them are being shown by the Industrial Accident Commission of California at every logging camp and sawmill in the state. The idea is to show actual conditions and the scenario was written by one of the safety engineers to be taken in the woods and at the mills themselves with mill employees as "actors." The idea is a new one in safety work and one which might well be applied to electrical industries.

* * *

A radiophone fog warning is being experimented with at the Point Judith light near Newport, R. I. The idea is based upon the fact that operators can judge to some extent the distance according to strength of signals with a known normal range. The apparatus will be in operation during fog, mist, rain and falling snow. The warning consists of the repeating of the words, "Point Judith Light," every five seconds, with limit range of about eight miles. After every third repetition the warning, "You are getting closer; keep off," is sent out with a limit range of about two miles.

* * *

A smokestack as high as a 25-story building is being built at the new addition to the Lacombe plant of the Denver Gas & Electric Light Company, and when it is completed and reaches 300 feet, it will tower above any structure in that city. Not only will it be an unusual height for a structure in Denver, but it will rank with the highest towers in the country. Its great height may be appreciated when one realizes that when complete, it will be taller than the famous Flatiron Building in New York, which is only 286 feet high.

* * *

You are lucky if your telephone number is 8 in Japan. This number is particularly preferred because the character spreads downward and suggests the idea of gathering prosperity; 42 and 49 are unlucky, on the other hand, because the former may be pronounced "shini," which means "to die," and the later may be pronounced "shiku," which means "death" and "suffering" These numbers are, therefore, generally taken by government officials, schools, police stations and other institutions which are presumably immune from dangers such as might befall the individual should he fail to heed the demands of superstition.

* * *

Visible sound waves are among the latest reports from the battlefields. In a recent number of L'Astronomie, are published three letters from different places near the war front describing the appearance in the sky of rapidly moving, parallel arcs of light and shade, seen at times when violent cannonading was in progress. The description states that they moved with the speed of sound waves and their appearance coincided with the successive discharge of particular mortars. The space between the bands was greater for large than for small cannon. Apparently their visibility, which lasted altogether about ten minutes, depended upon particular relative positions of the observer, the cloud, the cannon and the sun.

PERSONALS

Dr. M. Shibusawa, electrical expert of the Special Investigation Bureau, Ministry of Communications, Tokio, Japan, is a recent San Francisco visitor. Dr. Shibusawa is no stranger to the Pacific Coast States and the states further to the East. He acted on the commission of awards for Japan at the St. Louis Exposition in 1904. He expects to make a thorough survey of electrical conditions in the United States and Canada before returning again to Japan six months hence.

Ralph A. Beebee, a civil engineer of San Francisco, has been named by Mayor Davie of Oakland to fill the newly created position of efficiency engineer under the department of public affairs. He will enter upon his duties the first of the month. His duty for the present will be to gather information desired by the mayor relative to the traction and power companies with a view to municipal ownership. Mr. Beebee is a graduate of Stanford University with the engineering class of 1907. He has been engaged as construction engineer for the Federal Telegraph Company since 1910. He was nominated as a candidate for the position by Professor C. D. Marx of Stanford, who was requested by Mayor Davie to submit a list of engineer graduates who would be eligible for the position.

Edward B. Thompson, oil engineer of Bombay, India, was a recent visitor in San Francisco.

Noble D. Powell, an electrical contractor of Stockton, spent the first of the month in San Francisco.

C. F. Barrett has resigned his position as superintendent of Water Supply and Water Works of Salt Lake City, Utah.

H. O. Duerr of Denver, Colo., has been appointed consulting efficiency engineer for the city of Albuquerque, N. M.

J. G. Girard of Miami, Arizona, has been named engineer in charge of the construction of a hydro-electric plant on the Colorado River.

Harlow Moore is now connected with the Board of Fire Underwriters in Portland, Oregon, having resigned as district manager for the Pacific Power & Light Company at Seaside, Oregon.

C. B. Hall, secretary of the Illinois Electric Company, and **Miles Steel,** Pacific Coast manager of the Benjamin Electric Manufacturing Company, are enjoying a brief vacation in Honolulu.

V. S. McKenny, of NePage-McKenny Company, electrical engineers and contractors, Armour building, Seattle, has returned from a business trip to Spokane, Butte and Lewistown, Montana.

Paul H. Manchester, formerly with the Pacific Gas & Electric Company at Martinez, has joined the 37th regiment of engineers—a regiment composed almost exclusively of central station men.

J. P. Baloun, chief of the drafting department of the Pacific Gas & Electric Company, San Francisco, Cal., has left the company to accept a position with the Pacific Coast Shipbuilding Company.

W. F. Doherty, formerly with the Peirson Engineering Corporation of New York, passed through San Francisco recently on his way to take a position with the Tata Electric Supply Company of Bombay, India.

J. R. Geary, for fifteen years Japanese representative of the General Electric Company, passed through San Francisco recently on his way to New York. He will remain in the United States for about five months.

G. A. De Haseth, formerly with the Tacoma Railway & Power Company, has been appointed manager of the Ponce (P. R.) Electric Company, succeeding P. M. Hatch, now in the ordnance department of the army.

Samuel Adams Chase, the genial assistant to the supply manager of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, is again a Pacific Coast visitor and is receiving a hearty welcome from his many well wishers.

Hans Mumm, Jr., has resigned as city engineer of Everett, Wash., to accept a position with the Portland Cement Association with headquarters in Spokane. Mr. Mumm formerly was assistant city engineer of Everett, and Snohomish county engineer.

T. W. Mann, formerly of Paul's Electric Store, Medford, Oregon, who enlisted in the aviation corps last summer, has advanced to master signal electrician in the 372d Aero squadron and is busy getting ready to fight upon the battlefields of France at an early date.

Eugene C. Clarke has joined the Tacoma Railway & Power Company, Tacoma, Wash., to direct the instruction of trainmen and to handle general efficiency work. He resigned as supervisor of instruction for the Brooklyn Rapid Transit Company, Brooklyn, N. Y.

H. B. Sewell, formerly general superintendent of Houston Electric Company at Houston, Texas, has been chosen manager of the Puget Sound Traction, Light & Power Company and the Pacific Northwest Traction Company at Bellingham, Wash., and has taken charge.

Lester S. Ready, who for several years has been assistant engineer in the gas and electric department of the Railroad Commission of California, has been promoted to electrical engineer of that department, succeeding F. Emerson Hoar, who is now in government service.

F. T. Mumma, electrical engineer in charge of the electric sub-stations of the Chicago, Milwaukee and St. Paul main line, has been appointed superintendent of the telegraph and telephone department on the Anchorage division, of the Alaska Railways, succeeding Herbert Gaytes, resigned.

A. W. Eshelby, formerly with the British Columbia Electric Railway Company, has entered the railway department of the Westinghouse Electric & Manufacturing Company at the Seattle office and will have charge of railway motor equipment and control work in the Seattle territory for the company.

H. A. Bostwick, formerly assistant to the first vice-president of the Pacific Gas and Electric Company, who, as announced in the last issue of the Journal of Electricity, has been put in charge of the San Francisco district with the title of general agent, is receiving congratulations from all quarters over this recognition of his true worth to the electrical industry in the West. Mr. Bostwick has for years been a potent factor in utility work — both gas and electric. His long service as secretary of the Pacific Coast Gas Association has been especially effective. Mr. Bostwick's quiet but pleasing personality, combined with an overpowering sense of loyalty to his superiors, has won for him a host of well-wishers and admirers in the West.

E. W. Rice, Jr., president of the American Institute of Electrical Engineers, who recently passed through San Francisco after receiving marked honors from the Japanese government, has just delivered two forceful addresses at the annual Midwinter Convention of the Institute in New York City. Touching upon the electrification of railways, Mr. Rice said:

"It may be said that the present is not a propitious time in which to deflect any of the country's money into railroad electrification. I think that in spite of the enormous advantages of which I have spoken, we would be inclined to agree with such a point of view if it were not for the recent unpleasant demonstration of the failure of our railroad transportation systems to meet the demands which have been placed upon them by the industries, aggravated, it is true, by the war conditions and also by the unkindness of the weather.

"After all, the question for the country to decide is whether we dare to limp along with the present conditions of restricted production, due to limited transportation, at a time when the world demands and expects from us the greatest possible increase in our efficiency and total production."

Eugene J. De Sabla, Jr., promoter of companies out of which grew the Pacific Gas & Electric Company, returned to San Francisco late this month, after an absence of two years, to testify in bankruptcy proceedings arising out of the failure of the Northern Electric interests.

M. H. Aylesworth has been appointed assistant to the vice-president of the Utah Light & Power Company, Salt Lake City, Utah. He is an attorney and goes to Salt Lake from Denver, where he was a member of the Colorado Public Utilities Commission. The appointment of Mr. Aylesworth to this position became effective February 1.

Tracy Bibbins, president of the Pacific States Electric Company, and **W. M. Deming**, general manager of the Technical Publishing Company, publishers of the Journal of Electricity, left recently for a month's business visit in the East. Mr. Bibbins goes to Schenectady, while Mr. Deming is covering a number of manufacturing centers in his trip.

C. S. Walters, vice-president and general manager of the Walla Walla Valley Railway Company, was in Portland the latter part of last month. His principal mission was to discuss the question of joint rate arrangements with the Oregon-Washington Railroad & Navigation Company in connection with the possible construction of the Prospect Heights extension to serve the Langdon orchard.

Frank J. Silsbee, publisher of the Pacific Petroleum Record and well known as a statistical expert, has been asked by Mark L. Requa, in charge of the oil division of the fuel administration, to come to Washington to assist in co-ordinating petroleum statistics in the war work of the division. Silsbee accepted and will leave for Washington in a few days. For a number of years Silsbee was in charge of statistical and other work for the Independent Oil Producers' agency.

J. A. O'Donnell of Los Angeles has been appointed by Mark L. Requa, head of the oil division of the fuel administration, to take charge of oil production. For many years Mr. O'Donnell has figured prominently in the development of Western oil properties and through a very intimate knowledge of the oil fields he will seek at once to establish relationship between the government and the producers of oil that will help materially in winning the war by assuring ample production.

Fred Burnham of Glens Falls, N. Y., has been visiting in Alameda, Cal., before sailing for Afghanistan to take charge of a big electric light plant constructed by the General Electric Company for the Emir of Afghanistan. The plant is located near Tabool, in the heart of the country. Mr. Burnham leaves his wife and family in America, as Europeans are not allowed to take their families into the Afghan country at this time. From Calcutta he will proceed across India to the Afghan border, and then comes a three weeks' trip on horseback to Tabool.

George Fillmore Swain, professor of civil engineering in the Graduate School of Applied Science of Harvard University, who is to be lecturer on the Hitchcock Foundation for 1918 at the University of California, as announced on page 205, Journal of Electricity, February 15, 1918, is to be elaborately entertained at dinner by the engineers of San Francisco on March 20, 1918. President Wheeler of the state university will be asked to preside, while honored guests will be Max Thelen, president California Railroad Commission; David M. Folsom, Pacific Coast Fuel Administrator, and John McGregor, president of the Union Iron Works.

J. W. Lieb, president of the National Electric Light Association and chairman of the National Committee on Gas and Electric Service, of which John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company is a member, has been doing some excellent work in assisting the national government at Washington. The committee has been requested by the Quartermaster's Department to find in the public utility field, if possible, 200 or 250 competent auditors. It is extremely difficult to get information on this class of work, and the public utilities are probably in the same position as other industries in having very few such men available.

Dr. Henry Suzzallo, president of the University of Washington, and chairman of the State Council of Defense, has appointed a committee of nine to thoroughly investigate ways and means of preparing for the future of Seattle's transportation problems. This committee is made up of some of the most capable men in the city, who are: **Hamilton Higday**, manager of the port of Seattle; **Judge Brown** of the Great Northern Railroad; **Harold Preston**, attorney and member of the King County Council of Defense; **R. H. Thompson**, consulting engineer and member of the city council, chairman; **E. C. Mundrof**; **A. L. Valentine**, superintendent of public utilities, Seattle; **J. J. McCullough**, head of the unit management of the railroad terminals; **Guy W. Richardson**, superintendent of railway, Puget Sound Traction, Light & Power Company; and **George W. Aldin**, secretary of the Ames Shipbuilding & Dry Dock Company.

SKIP-STOP SCHEDULES FOR CAR LINES

The United States Fuel Administration has had under consideration for some time past the question of putting into effect "skip-stop" schedules on urban and interurban electric railways using coal as a motive source. The proposition before the Fuel Administration is substantially as follows:

The regular passenger stopping places for electric railways shall be spaced so as not to exceed eight per mile in urban districts and six per mile in suburban districts. On interurban lines the regular passenger stopping places shall not exceed four per mile. Where safety stops are necessary, they shall be combined, when practicable, with the passenger stops.

There are approximately 50,000,000 car stops made in the United States each day. The "skip-stop" schedule would eliminate one-third of these. The elimination of 6,000,000,000 stops a year, together with the regulation of car heating, will bring a fuel saving of not less than 1,500,000 tons of coal a year, which will meet the fuel needs of 300,000 average families.

EVENTS IN THE LIFE OF THOMAS A. EDISON

BY FRANK D. FAGAN

(Edison's birthday, which was celebrated during the past month, has come to be an event of considerable importance in the electrical world. He stands in the mind of the average citizen as the present day exponent of what America can do in the practical application of science. This brief history of his life, as it was presented before a recent meeting of the San Francisco Development League, should therefore be familiar to every electrical man.—The Editor.)

1847—

Born February 11th, at Milan, Ohio.

1857—

Started chemical laboratory in cellar of his home.

1859—

Became newsboy and "candy butcher" on trains of Grand Trunk Railway, running between Port Huron and Detroit.

1862—

Printed and published a newspaper, "The Weekly Herald," on the train. The first newspaper ever printed on a moving train.

1862—

Saved from death young son of J. U. Mackenzie, station agent of Mount Clemens, Mich. In gratitude, the father taught Edison telegraphy.

1863—

Spent nearly five arduous years as a telegraph operator in various cities of the Central Western States, always studying and experimenting to improve the apparatus.

1868—

Entered office of Western Union in Boston as operator.

1868—

Made his first patent invention, electrical vote recorder. The application for patent was signed October 11, 1868.

1869—

Landed in New York City from Boston boat, poor and in debt. Shortly afterward, while looking for work, was in operating room of Gold & Stock Telegraph Company when apparatus broke down. No one but Edison could fix it, and he was given job as superintendent at $300 a month.

1870—

Received his first money for inventions, the stock ticker, $40,000. Opened manufacturing shop in Newark, where he made stock tickers, etc.

1871—

Assisted Sholes, the inventor of the typewriter, to make the first successful working model.

1872 to 1876—

Worked on and completed many inventions, including motograph, automatic telegraph systems, duplex, quadruplex, sextuplex and multiplex telegraph systems.

1876 to 1877—

Invented the carbon telephone transmitter, which made telephony a commercial art, and which was combined in 1914 with his later invention, the phonograph, to form the telescribe.

1877—

Invented the phonograph. Patent was issued by United States Patent Office within two months after application, without a single reference.

1879—

Invented incandescent electric lamp. The invention was perfected October 21, 1879, on which day the first lamp embodying the principles of the modern incandescent lamp was put in circuit and maintained its incandescence for over 40 hours.

1879—

Invented radical improvements in construction of dynamo-electric machines, making them suitable for generators for systems of distribution of current for light, heat and power.

1881—

Established first commercial incandescent lamp factory at Harrison, N. J.

1880 to 1882—

Invented and installed life-sized electric railway for freight and passengers at Menlo Park, N. J.

1882—

September 4, commenced operation of first commercial central station in New York City for distribution of electric current for light, power and heat.

1891—Invented the motion picture camera. By the invention of this mechanism, with the continuous tape-like film originated by Edison, it became possible to take and reproduce motion picture as we have them at this day.

1900 to 1910—

This period covers the work resulting in the invention of the Edison Alkaline Storage Battery, and its commercial introduction.

1914—

Edison, being the largest individual user in the United States of carbolic acid (for making phonograph records), found himself in danger of being compelled to close his factory by reason of the embargo placed on exportation by England and Germany, the sources of supply, carbolic acid being used in making explosives. Edison devised a plan for making carbolic acid synthetically, set gangs of men working 24 hours a day to build a plant, and on the 18th day was making the acid. Within four weeks plant could turn out a ton a day.

1914—

On the night of December 9th, Edison's great plant at West Orange, N. J., was the scene of a great conflagration. Early next morning gangs of men were at work clearing up the wreck. Hundreds more were added during the day and work was continued 24 hours a day. Within 36 hours after the fire Edison had given full orders for the complete rehabilitation of the plant.

1915—

Early in the year 1915 Edison found that he was in danger of being unable to obtain a continuous supply of benzol, from which he made his synthetic carbolic acid. He decided to erect his own benzol plants. He experimented and perfected it in his laboratory at Orange, N. J., and arranged with two coke oven plants to put in his benzol plants. The first was installed at the Cambria Steel Co.'s plant at Johnstown, Pa., which was installed and put into operation in 45 days. Four other plants have since been installed.

The same year Edison conceived the idea of helping the textile and rubber industries of America by making myrbane, aniline oil and aniline salt, which had previously been imported from Germany. With much effort and hard work, he installed a plant in 45 days, commencing deliveries in June, 1915. He is now manufacturing 4000 pounds a day.

1917—

Since the United States entered the war, Mr. Edison has been constantly co-operating with the United States Government in various experiments, making them at Orange, N. J., and elsewhere.

MEETING NOTICES FOR ELECTRICAL MEN

(The many informal committee meetings which are being held throughout the West looking to the successful outcome of the N. E. L. A. convention at Del Monte in April, are perhaps the most important of the two weeks' meetings. A coming convention in the Southwest, as well as local meetings of considerable interest are further featured below.—The Editor.)

The Southwestern Electrical and Gas Association

After full deliberation on the subject, the executive committee of the Association decided that it would be for the best interests of the members of the Association and the other public utilities of the Southwest that a convention be held in 1918. There is so much business of importance to the utilities of the state now about to come to a head that it was considered necessary that all the utilities of the state, without regard to their membership in the Association, be urged to meet and discuss these and to arrive at a definite conclusion as to some united action on them within the next few months.

The executive committee, therefore, has assigned the days of Monday and Tuesday, the 15th and 16th of April, for the holding of the convention at Galveston, Texas, the headquarters to be the Galvez Hotel.

In order to be consistent in the matter of economy, the executive committee has made this a two-day convention instead of a three-day convention, as hitherto, and it has also cut out all forms of general entertainment for those attending, it being the idea of the committee not only to so economize expense and time but also to make this a strictly business convention, every moment of the two days to be devoted to the exceedingly important business which will be brought before those attending.

San Francisco Section, A. I. E. E.

"Technical Features of the Interconnection of Electric Power Systems of California," was the subject of the February 28th meeting of the San Francisco Section of the A. I. E. E. The field was covered by a series of speakers covering various phases of the subject.

P. M. Downing talked briefly on the general aspects of the subject. G. S. Jacobs covered chiefly part of the matter contained in the recent Railroad Commission Report, showing combined load curves, growth of load, oil situation, etc.

The effect of the interconnection on the Pacific Gas & Electric system was discussed by J. P. Jollyman, and J. E. Woodbridge, W. B. G. Butler and W. M. Shepard spoke in general on the question of what their companies can contribute to the general power pool.

H. A. Barre sent in a paper discussing some of the features of interconnection as carried on in Southern California.

The Synchronous Club

The Synchronous Club of Los Angeles held its February meeting at Walker Theater Building, Roosevelt Hall, on Thursday evening, February 21st, 1918, at 8:00 o'clock. Lecture No. 9 of the Synchronous Electrical Course, on the subject of Steam, Gas and Oil Engines, was presented by J. W. Andree of the Southern California Edison Company.

BUILDERS OF THE WEST—XXIV

A. G. WISHON

Loyalty is a virtue that has been admired by men throughout all history. By means of it nations have risen to world prominence and decaying dynasties been overthrown. Perhaps the instilling of loyalty among the workers in utility life of the West has added more than any other factor in making hydro-electric activity of this section of such record-breaking and effective strength. To A. G. Wishon, general manager of the San Joaquin Light & Power Company, builder and executive in the San Joaquin Valley—the greatest combined acreage in the world served by electrical pumping—this issue of the Journal of Electricity is affectionately dedicated in appreciation of his great service to the West — the lesson taught from his method of instilling simple, man-to-man loyalty among his workers.

Notes of California Association of Electrical Contractors and Dealers

Fresno: A meeting of the Advisory Committee of the California Electrical Co-operative Campaign met at Fresno, February 28th, and outlined further work for carrying out the details of the campaign. Mr. A. L. Spring, field representative operating in Southern California, presented a detailed report of conditions as he found them in various sections of the territory during his preliminary survey of that field, made during recent months.

Monterey: The Monterey Bay Electrical Contractors and Dealers held a get-together meeting at Watsonville, Saturday evening, February 16th, with practically a full attendance of all members. Officers for the new term were elected as follows:

W. Cox, Santa Cruz, president.

J. Stanovich, Watsonville, vice-president.

J. A. Noggle, Monterey, secretary-treasurer.

Sacramento: The Sacramento electrical contractors report increasing interest in the closer study of business methods recently instituted in their meetings. President H. C. Reid of the California Association of Electrical Contractors and Dealers, and M. A. De Lew were recent visitors to that city.

Electric Metermen's Association

February, 1918, has seen the commencement of the second year of the Electric Metermen's Association, whose membership comprises meter department superintendents, heads and others whose duties consist of electric meter, instrument and laboratory testing. Membership comprises upward of twenty-five men residing in California north of the Tehachapi, representing the more important power companies in the same territory.

Meetings are held approximately every 50 days, at which papers are read relating to methods used in meter testing, installations, etc.; also uses of current and potential transformers and other auxiliary apparatus. At the conclusion of the papers, discussions are entered into by all members present.

At some of the meetings a dinner is held previous to taking up regular businesss. Present officers are as follows: A. E. Coney, Great Western Power Company, secretary. C. V. Kuchel, Great Western Power Company, treasurer. J. E. Bridges, Westinghouse Electric & Manufacturing Company, chairman.

San Francisco Electrical Development League

The league meeting for Wednesday, February 13th, was devoted to the first definite announcement of plans for the great all-inclusive convention, at Del Monte, April 24th to 27th. These plans were set forth in detail by Robert Sibley, editor of the Journal of Electricity and general chairman for

the forthcoming convention. W. L. McKinley of the Sierra & San Francisco Power Company, and chairman of the membership committee of the Pacific Coast Section, N. E. L. A., presided.

The league, with only three dissenting votes, adopted the new constitution as it appeared in the Journal of Electriciay for February 1, 1918, with a few minor corrections. As a consequence the word "Jovian" will not in the future appear in the official name of this organization.

The following officers were then unanimously elected for the ensuing term:

President, R. E. Fisher, Pacific Gas & Electric Company.
First Vice-President, H. C. Reid, Pacific Fire Extinguisher Company.
Second Vice-President, H. P. Pitts, Pacific Gas & Electric Company.
Secretary-Treasurer, J. W. Redpath.
Executive Committee — Tom Bennett, Rex Electric Co.; W. S. Berry, Western Electric Company; E. O. Shreve, General Electric Company; Frank Rieber, Rieber Laboratories.

COMMITTEES

Public Policy—T. E. Bibbins, chairman; W. M. Deming, H. Bostwick, W. S. Berry, ex-officio.
Finance—C. F. Butte, chairman; L. H. Newbert, S. B. Anderson, H. C. Reid, ex-officio.
Visiting and Relief—E. M. Cutting, chairman; James Littlefield, M. A. De Lew, K. I. Dasey, J. K. Lippincott, E. O. Shreve, ex-officio.
Reception and Attendance—W. R. Dunbar, chairman; Tracy Simpson, E. E. Brown, J. M. Barry, Wallace Brown, W. C. Wurfel, Miles Steel, H. L. Hawkins, A. E. Rowe, S. B. Gregory, H. P. Pitts, ex-officio.
Entertainment—F. E. Boyd, chairman; J. F. Pollard, G. I. Kinney, Harry Noack, Rod Guyett, Garnett Young, Frank Rieber, ex-officio.
Membership—George H. Curtis, chairman; R. F. Behan, Murray Orrick, J. B. Black, Frank Thrall, W. B. Sawyer, Ed Whaly, A. Youngholm, J. W. Redpath, ex-officio.
Publicity—A. H. Halloran, chairman; Nathan Bowers.

At the meeting for February 20, 1918, President Fisher made forceful announcement of his plans for the coming term, which include the publication of a League Directory, setting forth the names, businesses, telephone numbers and addresses of all members.

Miss Clotilde Grunsky, associate editor of the Journal of Electricity, gave a talk on the Bible and its electrical applications, bringing in many allusions to league members, which proved extremely entertaining.

Pacific Coast Section, N. E. L. A.

Activities of the Pacific Coast Section, N. E. L. A., are proceeding apace. The membership committee is holding weekly luncheon meetings in San Francisco under the able chairmanship of W. L. McKinley. The papers committee of the commercial section will hold a meeting at Fresno, Cal., during the coming week, while the papers committee of the engineering section is fast getting its papers into final shape for the forthcoming Del Monte convention, April 24-27, 1918.

The convention committee, under the leadership of Robert Sibley, editor of the Journal of Electricity, will hold a meeting in Los Angeles, in the office of E. R. Northmore, of the Los Angeels Gas & Electric Corporation, on Wednesday, March 13, 1918, at 10 o'clock. It is expected that the other Southern California members will be present—Messrs. A. B. West, H. H. Jones, W. L. Frost. President H. F. Jackson has stated that he will meet with the committee at that time, and at the meeting of the Los Angeles Jovian League on that day put before the Southern California men the big things that are in the planning for the convention.

San Francisco Section American Society of Mechanical Engineers

The San Francisco Section of the American Society of Mechanical Engineers has taken a decided step forward under the able leadership of B. F. Raber, associate professor of mechanical engineering at the University of California. Weekly luncheons will hereafter be held on Thursday of each week at the Engineers' Club in San Francisco, to which all members of the American Society of Mechanical Engineers are invited. The luncheon price is 65 cents, and the club headquarters is on the top floor of the Mechanics' Institute Building.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers
President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section
Chairman — Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section
Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.

Denver Section
Chairman — Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary — Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.
February 16—Speaker, F. W. Hild. Subject, "American Electric Railways and the War."

San Francisco Section—
Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings — Fourth Friday each month—Engineers' Club, 7 p. m.
February 28 — Subject, "Technical Features of the Interconnection of Electric Power Systems of California."

Seattle Section
Chairman — John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary — Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.
February 19—Speaker, C. Kirk Hillman. Subject, "Alternating Current Motors."

Spokane Section
Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
February 15—Fifth Anniversary Meeting. Subject, "Symposium on Distribution."

Utah Section
Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section
Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
Chairman — A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch
President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
Chairman—V. Pearson, Moscow, Idaho.
Secretary — L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch
Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Happold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch
Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch
Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College
Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch
Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
Chairman — S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
President—Col. Robley Stearnes, New Orleans, La.
Secretary — Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Directors — California: W. D. Kohlwey, San Francisco. Oregon: Samuel C. Jaggar, Portland.
Next Convention—Cleveland, July 17-20.

British Columbia Ass'n Electrical Contractors and Dealers
President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers
President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco
President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings — Saturday, 12:15; Hof Brau Cafe.

Southern California Electrical Contractors and Dealers
President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers
President — A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers
President—Allen S. Halls, 517 Railway Exchange Bldg., Portland.
Treasurer — J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p.m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers
President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings — Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers
President — V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary — H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings — Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association
General Secretary — Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
President—Sam H. Taylor, 84—2nd St., San Francisco.
Secretary — Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Last meeting: Del Monte, January 24.

Electrical Credit Ass'n of the Pacific Coast
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary — Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST

National Electric Light Association
President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.
President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next meeting — Del Monte, April 24-27, 1918.

Portland Section, N. E. L. A.
Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary — R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society
Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association
President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association
President—H. C. Morris.
Secretary — H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
1918 Convention—April 15th and 16th, at Galveston, Texas. Headquarters, Galvez Hotel.

Northwest Electric Light and Power Ass'n
President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League
President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings — Every Wednesday, 12 m., at Jahnke's Tavern, 524 S. Spring Street.
February 23 — Speaker, F. R. Feitshans. Subject, "Alaska."

San Francisco Electrical Development League
President—R. E. Fisher
Secretary — J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.

Electric Metermen's Association
President — J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary — A. E. Coney, Great Western Power Company.
Meetings—About every 50 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary — George B. Furmiss, Pacific Gas & Electric Company, Oakland, Cal.
Next meeting—March 21st.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

National Officers
President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—B. F. Raber, University of California, Berkeley.
Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
Meetings—Quarterly.
February meeting—February 7th. Speaker—L. D. Gilbert. Subject: "The Practical Side of Portland Cement Manufacture."

ENGINEERS' CLUBS

Oregon Society of Engineers
President — Orrin E. Stanley, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
President—J. F. Pinson, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.
President — B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual meeting: October.

Idaho Society of Engineers
President — W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise.
Annual meeting: January.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

American Chemical Society—Oregon Section
Secretary—Norman C. Thorne.

Foreign Trade Club
President — W. H. Hammer, Monadnock Bldg.
Secretary — Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
February 20—Speaker, Frank G. Hinckley. Subject, "Commercial Law in China."

Pacific Coast Gas Association
President — John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

Personal Items

Calvin Armstrong of Arcata, Cal., has purchased the interest of Frank S. Anderson in the Arcata Electric Shop, and the new firm will hereafter be known as Brand & Armstrong.

R. W. Wise was elected secretary of the Petaluma and Santa Rosa Railway Company to succeed T. B. McMurray, following the annual meeting of the stockholders. No other changes in officers were made, and all retiring directors were re-elected. No other business of any consequence was considered at the meeting.

P. J. Diebold, for many years foreman of electric motor repairs with the Capitol Electric Company, and for the past two years associated with M. N. Farr in the Farr-Diebold Electric Company, has organized a new electric company, with headquarters at 132 West Second South.

P. E. Yates has undertaken the management of the Pacific Coast branch of the Delta Electric Company, which has been established at 686 Mission street, San Francisco. The factory is located in Marion, Indiana.

H. S. Tuttle of San Francisco has been awarded the contract for installing electric conductors and appurtenances on the Market street municipal railroad, between the east portal of the Twin Peaks Tunnel and Church street, and between Van Ness avenue and Geary street.

B. A. Wagner and **L. Babcock** have taken over the Electrical Agencies Company, Inc., with offices at San Francisco and Los Angeles. Mr. Wagner has just returned from Los Angeles, where he has been active in establishing the office there. The company also has an agency in Seattle.

Present and Future Power Loads

The Western States Gas & Electric Company has accepted contract with the Stockton Fire & Enamel Brick Company for 250 horsepower in motors, which is an additional installation for an enlarged factory. New business recently secured includes a 150 horsepower addition to the power load of the Holt Manufacturing Company.

The Coos Bay Shipbuilding Company at Marshfield, Oregon, will add 200 men to its payroll, practically doubling its force. Plans are under way for the establishment of a briquetting plant at Marshfield, to employ from 50 to 75 men to begin with.

Eight hundred and ten kilowatts of electric cooking and heating apparatus were added to the lines of the electric company in the Lodi, Cal., district, during 1917. The following appliances were placed in active service during the period: 83 electric ranges, 71 water heaters, 75 room heaters, 1 disc stove, and 231 other appliances.

Active construction has been begun by the California Sea Products Company on its first shore whaling station at Moss Landing, on Monterey Bay, and the plant is expected to be in operation in two or three months. Buildings and machinery together will represent an investment of about $100,000, according to the company's estimate.

Changes and Beginnings

The Chicago Fuse Manufacturing Company, Chicago, Ill., manufacturer of the "Union" line of electrical protecting materials and conduit fittings, has secured the exclusive right to manufacture the Multi-refillable fuse, under patents owned and controlled by the Multi-Refillable Fuse Company, Chicago. The transaction also includes the good will and trademarks, as well as the merchandise and machinery required in the production of this fuse, which will hereafter be known as the "Union" renewable fuse.

The Riley-Harness Telephone Company at Sprangle, Wash., has been incorporated with $250 capital stock by John Emhoff, W. P. Tolle and W. E. Blevins.

The spruce cut-up plant of the United States Signal Corps at Vancouver, Washington, has been put into commission. This contains over 100 Allis Chalmers Manufacturing Company motors, also a large quantity of sawmill machinery furnished by this company, all of which was delivered, installed and placed in operation within 58 days.

The Wenatchee Valley Gas & Electric Company, of Wenatchee, Wash., has decided to install an additional power plant at Chelan Falls of 1,000 horsepower, according to G. D. Brown, president.

Timely Interest by Federal Authorities in Hydro-electric Development

In view of the active part the Journal of Electricity has been playing editorially in urging upon the government the necessity of unlocking its vast store houses of hydro-electric energy, the following dispatch from Washington is of unusual interest:

With the approval of President Wilson the federal railroad administration is about to interest itself in street railway, light, heat and power companies throughout the country whose financial stability may be threatened by mounting costs of operation. Where it appears necessary, increases in fares or rates may be suggested.

Correspondence between Secretary McAdoo, as Director-General of Railroads, and the President, made public recently, discloses that a committee representing public utility interests recently presented memoranda to the secretary, setting forth a most serious situation and asking that it be brought to the attention of the President. McAdoo and the President agreed that public utilities are a necessary part of the nation's equipment for war, and the secretary was authorized to communicate with local authorities in behalf of utilities found to need assistance.

Aeroplane Factory at Portland

The Beaver Electric Company of Portland, Oregon, is the firm that installed the electrical equipment in the O. K. Jeffery aeroplane factory, described at some length in the Journal of Electricity for February 15, 1918. This installation is now complete in every detail. All machines are driven by individual motors. This enterprising firm of electrical contractors is now adding another hundred horsepower on account of the rapid growth of the factory in having to turn out war orders on aeroplane parts.

Light and Power Plant Active

The city of Seattle lighting department has secured contract for the power to be used in the shipyards of the Erickson Engineering Company, now under construction, which will have five ways for steel ships and use 2500 horsepower. The unit of the city's auxiliary steam plant on Lake Union, now under construction, will probably be completed in March and will have a capacity of 12,500 kilawotts. The first unit has a 10,000 kilowatt capacity, which with the 10,000 kilowatts produced at Cedar Falls, aggregates a capacity of 32,500 kilowatts or 40,000 horsepower. The industrial growth of the city is such that the proposed plant on the Skagit River in the forest reserve will have heavy demands made upon it as soon as it is ready.

Washington Water Power Company's Financial Statement

At the annual meeting of the Washington Water Power Company, held at Spokane on February 4th, the annual financial statement of the company was presented, giving operating statistics for the past year. The number of customers increased from 32,067 in 1916 to 34,146 in 1917. During the year $397,443 was expended for distribution system and equipment in the light and power department, and $26,565 for buildings,

fixtures and grounds. The street railway system spent $32,407 for road and structures. There was an increase of about 1,700,000 in passengers carried on the street railway in 1917, compared with 1916. This did not, however, increase the earnings, due to increase in wages. A heavy increase was recorded for the Coeur d'Alenes in Idaho, on account of mining activity in that section, the chief feature of this being the smelter of the Bunker Hill & Sullivan Mining and Concentrating Company, which began operations last July at Kellogg. In other lines mentioned it was shown that 945 electric ranges were sold and installed, also 390 electric water heaters for domestic use. Net earnings for the year aggregated $636,041.02. Total assets are $28,233,656.35.

Increased Cost of Materials

At a hearing to ascertain the valuation of Washington Water Power Company, at a joint hearing of the Washington and Idaho Public Service Commissions, the testimony of engineers was to the effect that the reproduction of the $18,000,000 light and power plant system of the company would cost 50 per cent more at the present time than when it was constructed.

New Bond Issue

The Sierra and San Francisco Power Company has filed with the Railroad Commission its eleventh supplemental application in the matters of its request for authority from the commission to issue $1,000,000 first mortgage bonds, and to reimburse its treasury for capital expenditures, requesting the commission now for permission to reimburse its treasury $34,463.05 for capital expenditures during August, September, October and November, 1917. The company has out of the $1,000,000 issue already paid for expenditures and reimbursed its treasury $815,531.95.

Northern California Power Company Earnings

Northern California Power Company Consolidated closed the year 1917 with 10,044 consumers on its books, 378 new services having been added during the year. Gross operating revenues for the year amounted to $965,915, of which sum all but $80,000 was received from sales of electric power. This is an increase in gross over 1916 of $119,688. In addition to revenues from sales of electricity, gas and water, the company received $17,746 as profit on merchandise sales and other income, making a grand total income of $983,661, as compared with $857,448 in 1916.

Railroad Commission Decisions

The Railroad Commission recently denied the application of the Yolo Water and Power Company for a rehearing. The petitioner asserted that its contract with the State Farm at Davis had not been considered by the Commission. In dismissing the petition the Railroad Commission says it still holds that an order of the Commission relative to rates and service must be obeyed, as against the provisions of contracts entered into before the effective date of the public utilities act.

The Southwestern Home Telephone Company recently was authorized by the Railroad Commission to issue $89,050 6 per cent two-year notes, secured by the pledge of $177,500 first mortgage 5 per cent bonds. The company is also permitted to issue $80,625 of trustees certificates.

Wider Range of Bids Wanted for Seattle Site

Amendment of the ordinance authorizing the issuance of $5,000,000 of utility bonds for a completed hydro-electrical plant, and the amendment of the plans and specifications calling for bids for a completed plant within the federal reserve, may be made by the city council in order that bids may be received for projects not wholly within the federal reserve. Plans and specifications adopted by the board of public works, on which bids have been invited for opening on March 1, would limit the bidding to the Skagit river.

Fuel Oil Licenses

Latest reports indicate that the Presidential proclamation requiring licenses from oil companies applies only to companies manufacturing fuel oil in the form of residuum and gas oil, in amount in excess of 100,000 barrels per annum. It is not necessary for any producer to have a license to sell crude oil used as fuel oil. The preferential list of consumers provided in the order applies only east of the Rocky Mountains.

Company Will Pay on Condition

The Puget Sound Traction Light & Power Company proposes to the city of Seattle that it will pay $72,443.50, which represents two per cent of its gross street car earnings for 1917, under the same condition that the payment of $64,387.78 for 1916 was tendered a year ago. After the traction company had petitioned the public service commission in 1916 to be relieved of certain of its franchise obligations, including the payment of two per cent of its gross earnings to the city, the paving of rights of way and any portion of bridges, a conference with the mayor brought about an agreement that planking should be done in lieu of paving and that in the event the relief sought for was granted by the public service commission, that the amount of gross earnings tax for that year should be refunded. On January 3, 1917, the company tendered payment of $64,387.78 with the stipulation that suit started by the city to force compliance with the paving provision be dismissed or withdrawn until final adjudication of the petition for relief. This payment was for 1916 earnings. Payment was refused by council and the amount returned to the company, the city then bringing suit to recover the amount. Payment of 1917 gross earnings tax is now tendered under exactly the same conditions.

Will Contest Fare Raise

Seattle will resist the effort of the Puget Sound Traction Light & Power Company to obtain an order from the Public Service Commission allowing a greater fare than five cents within the city limits. Corporation counsel has been instructed to prepare such ordinance as he deems necessary to resist any order that would relegate the state and city laws, limiting street car fares within the city limits to five cents. Public service commission recently stated that if a petition should be presented to raise the fare in Seattle from five to six cents, it would be given a hearing.

Tacoma Municipal Railway Makes Money

During the period from November 12 to December 31, 1917, the gross earnings of the Tacoma, Washington municipal electric line were such as to show a gain over the expense of operation. The line was operated for the city by the Tacoma Railway & Power Company. The gross earnings for the period were $9573.84, expense of operation $7233.66, net income $2340.18.

Proposed Steel Rolling Mill

The United Steel Company has been organized for the purpose of building a steel rolling mill at Everett, Washington. The temporary officers of the concern are W. E. Stillinger, 405 White Building, Seattle, chairman of the board of trustees, and J. Johnson, secretary. The technical and structural work of the plant will be under the direction of the secretary, who has had fifteen years' experience in the iron and steel plants of British Columbia. He is the prime mover in the proposition and began work on the plant eight months ago. All the details for the machinery have been completed and the first unit will be housed in a 60 x 200 foot building. This unit will comprise a 12-inch mill with two reheating and one electric furnace with a capacity of 60 to 100 tons a day. Negotiations are practically completed for the site and it is proposed to begin building work in about two weeks' time and to have the mill started in about four months.

Municipal Line Loses Money

During 1917 the municipal street car system of Seattle was conducted at a net loss of $34,958.39, according to the annual report of Superintendent of Public Utilities A. L. Valentine.

Square D Company Holds Annual Sales Convention

The First Annual Sales Convention of the Square D Company, Detroit, Mich., was held at the Hotel Statler in that city on January 10, 11 and 12, and was attended by all of their sales representatives from coast to coast, several advertising men prominent in their field, and members of the company's advertising and sales departments.

Bryson D. Horton, president of the company, gave the opening address, which was followed by a talk on "The Industrial Plant," by A. MacLachlan, sales manager. L. D. Calhoun, advertising manager, spoke on "Industrial Advertising."

SERVICE DEPARTMENT

The following is a partial list of the applicants on our books. Employers interested in any of those listed will please use the file number in communicating with the Service Department, Journal of Electricity.

A 1—**Local Superintendent—Power Company.**—Age 33. Married—one child. General experience care and maintenance of lines; last 5 years local superintendent power company. Wants $175.

B 2—**Electrical or Mechanical Engineer.**—Age 29. Married. University graduate. Four years superintending foreman and estimator. Wants $150.

J 1.—**Salesman or in Purchasing Department.**—Age 31. Married. Two years college. Two years manufacturing company; five years central station work in commercial departments. Would not consider sales work with power company. Wants $150.

J 2—**Traveling Salesman or Advertising Department.**—Age 21. Unmarried. Two and a half years advertising and traveling experience—electric piano, electric sign, etc. Desires work in California or Oregon. Wants $100.

J 3—**Superintendent Meter Work** (or electrical estimating and construction). — Age 25. Married—1 child. Four years experience in various testing and construction departments power companies. Wants $125.

L 1—**Electrical Locomotive Engineer or Superintendent Light and Water Works.**—Age 33. Married, 2 children, Six years stream traction engines; four years chief engineer and electrician industrial works; six years town superintendent water and light, two years city superintendent water and light. Desires position in warm climate for child.

M 1—**Electrical Engineer.**—Age 26. Unmarried. University graduate. Five years engineer distribution department power company. Wants $150.

P 2—**Salesman.** — Age 23. Married. College training. Two years experience as salesman. Wants $100.

R 1—**Winder or Repair Man.** — Age 27. Unmarried. Scotch. Five years apprenticeship; one year railway company; six years winding and construction. Wants $100.

T 1—**Superintendent of Operation or Construction** (electrical or mechanical engineer).—Age 42. Married—3 children. Twenty years varied experience; foreman diamond drills, South Africa; electrician sergeant U. S. Army; chief engineer power company; foreman of construction, mining company; chief engineer power equipment mining company, etc. Wants $250-$300.

W 1—**Chief Engineer or Assistant to Manager.**—Age 37. Married—1 child. University graduate. Engineering apprenticeship course. One year salesman electrical machinery; one and one-half years assistant electrical inspector; 8 years electrical inspector and electrical engineer. Wants $250.

Women's Department

G 1—**Secretary**—Young woman. University graduate—expert stenographer and typist. One year business experience. Wants $90.

WAR SERVICE THROUGH WAR SAVING

BY JOHN S. DRUM

The fate of this nation may depend upon the ability of the people to grasp the vital facts of the War Savings plan, and their willingness to put this plan into effect.

We often hear that money will win the war, but it must be remembered that money is a symbol only — a symbol of purchasing power which stands for the possessor's command over labor and materials.

When Congress appropriates twenty billions of dollars for war purposes, it means that the government is to be placed in control of labor and materials measured by that amount, which the people must pay for.

If there were an inexhaustible supply of the kind of materials and type of labor which the government is calling into use in the production of the necessities of war, we could pay for them through the creation of great credits and continue to live as we did in the past. But when we know that the supply is limited and that no amount of money can increase it, we realize that unless the people reduce their normal demands upon the productive agencies of the nation through saving instead of spending, we are trying to lift ourselves by our boot-straps.

Recognition of this fact gave rise to the War-Savings plan.

Great success has attended the two big Liberty Loan campaigns. Vast credits were raised to meet the immediate needs of the government. But while a few of the people—less than 10 per cent—subscribed liberally in the aggregate, the bulk of the loans was taken up by the big financial, commercial and industrial interests of the country. Most individuals who bought Liberty Bonds bought them out of their surplus, or with borrowed money. Very few gave up anything, made any real sacrifice or reduced their expenditures. Thousands of subscribers parted with their bonds almost as soon as they came into possession; and finally, 90 per cent of the people made no investment at all.

Subscriptions to government securities in war-time must come from thrift wealth to the greatest possible extent, and must be accompanied by an actual reduction in the individual's demands upon the productive resources of the country.

The War-Savings plan is designed not to teach thrift and saving, but to teach the meaning of thrift and saving in war time. It provides a special inducement to every one, but particularly to the 90 per cent of the population who have made no investment in Liberty Bonds, to practice sensible economies in their daily living and lend the money they save to the government in return for a guaranteed non-shrinkable security bearing 4 per cent compound interest. War-Savings Certificates are within the reach of every man, woman and child. The plan contemplates a series of day-to-day investments from day-to-day savings throughout the whole year, amounting in the aggregate to two billion dollars, or twenty dollars for every man, woman and child, or a total of $2,000,000,000.

I have not touched upon the vital importance to the nation of every individual practicing self-denial as a conscientious duty, and the tremendous value of the kind of patriotism engendered thereby. Equally with the money and the things that money stands for, the government needs a will-to-win on the part of the people, who have it in their hands to spend wastefully and impede the war machine or perform true war service through war-saving.

LATEST IN EVERYTHING ELECTRICAL

(If the feet are kept warm, it is possible to stand any temperature. A foot warmer designed for use out of doors for those who must stand great exposure is here described. A starting switch which protects the motor against overload and under-voltage, a new line of choke coils and snap switches, as well as a meter for measuring coke oven gas and an automatic controller for flashing signals follow.—The Editor.)

Hubbell Toggle Snap Switches

The Hubbell Toggle Surface Switch differs from the ordinary snap surface switch in that manipulation is by the throw of a lever or toggle, instead of by the turning of a key or button. Throwing the lever up makes the circuit; throwing it down breaks the circuit. The movement is positive—the make and break quick and snappy.

The advantages of the toggle movement in a surface switch are three-fold—first, it permits making the switch more attractive and stronger than the ordinary switch; second, manipulation is much more convenient by means of the lever than by the turning of a key; third, the switch is self-indicating, the position of the lever showing at a glance whether the current is "on" or "off" without any marker or dial.

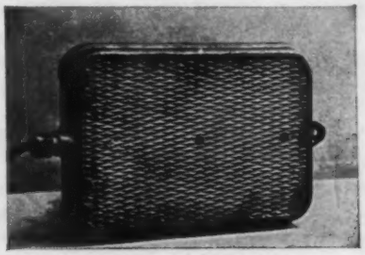
Exterior of toggle switch with view of the interior of the single pole and three-way type

Electrically, the Hubbell Toggle Surface Switch conforms with the most rigid requirements of current practice. Mechanically, it is amply strong to resist the most severe duty—special care having been given to selection of materials and proportioning of parts to assure the utmost dependability.

It combines in unusual degree the best mechanical and electrical features, with an appearance which makes quick appeal to those seeking the dignity of simplicity and richness.

Foot-Warmer for Outdoor Service

To minimize the discomfort of long standing outdoors in severe weather, an electrically heated foot-warmer has just been placed upon the market by the Westinghouse Electric & Manuufacturing Company of East Pittsburg, Pa. While designed primarily for lookouts stationed in the bow and crow's nest of vessels, the device is applicable to the use of watchmen, sentries, doormen, traffic policemen and others whose work requires them to be out of doors continuously with little chance for exercise. It has been found that if the rest of the body is adequately clothed, a foot-warmer will ensure comfort at any temperature.



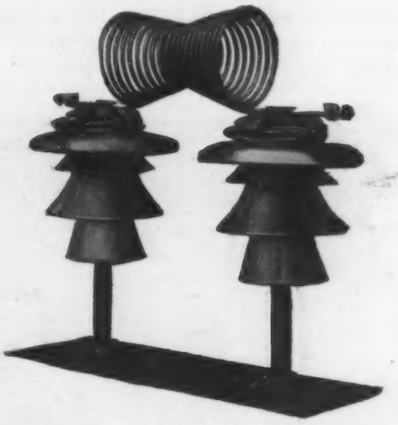
Top view of foot warmer

As will be seen from the illustration, the device consists of a casting 14 inches by 20 inches by 25 inches with diamond-tread top. This is of castiron, or of aluminum where non-magnetic qualities are desired, as in ship service. Against the under surface of this the heated element is clamped. The heater is a slotted ribbon clamped between two plates of built-up mica, so arranged as to give uniform distribution of heat. A sheet-metal plate fastened by screws and sealed with high-melting gum renders the entire unit waterproof. The resistance is divided into two parts, which may be connected to draw 200, 100 or 50 watts at 125 volts. A three-conductor cable seven feet long is provided. By using the lower heats in mild weather, there is no danger of causing chilblains.

It is felt that this heater will add greatly to the comfort and hence to the efficiency of men in exposed places, enabling them to do their highly important work of watching and guarding without the distraction of physical discomfort.

Choke Coils for Alternating Current

A new line of choke coils for alternating current circuits has recently been put on the market by the General Electric Company. Choke coils should be considered as auxiliaries to lightning arresters. The function of a choke coil is two-fold: (a) To hold back the lightning disturbance until the lightning arrester has time to discharge it to earth. (b) To lower the frequency of whatever part of the disturbance goes through the coil so that it will be less dangerous to the connected apparatus.

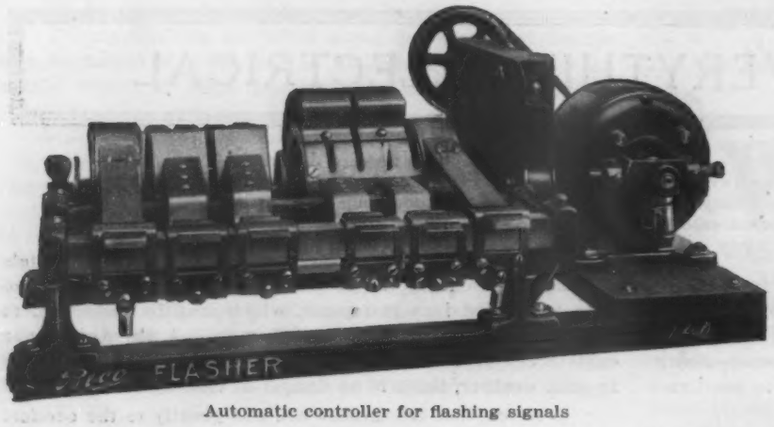


37,000 to 73,000 volts inclusive—outdoor service

The air insulationn between turns of the G-E coil is an extremely important feature in the designs, as high frequency disturbances are likely to take the path across any supporting or separating pieces, thus nullifying the action of the coil. The air insulation has the advantage that should any arcing between turns occur, because of extremely heavy disturbances, the turns will re-insulate themselves. The copper coil also presents a very good appearance, conforming to the general appearance of strength and stability, characteristic of the modern power plant.

Measuring Coke Oven Gas

Increasing quantities of surplus gas from by-product coke oven plants are being consumed in various processes in steel mills, and it is desirable to have an accurate and reliable measurement of this gas. For this purpose, the Thomas meter has been applied, which measures the quantity of gas in standard units such as cubic feet at 30-60, without any calculations or corrections for pressure and temperature, although these may vary through wide ranges. The total quantities (in cubic feet) are shown on an integrating meter and



Automatic controller for flashing signals

the rate of flow is shown graphically on a curve drawing instrument. The graphic chart obtained from this instrument is very useful to the superintendent of a coke oven plant, showing him at a glance the amount of gas being used for fuel in the coke ovens over any period with variations in quantities clearly indicated.

The meter is installed in a housing which replaces a portion of the gas pipe line. The principle of the Thomas meter is that it measures the heat capacity of a gas electrically. The amount of electric heat necessary to raise a standard unit two degrees is used as a measure of the gas flowing through the meter. The electricity for heating the gas can be conducted on comparatively small wires, consequently the meters showing the amount of gas used can be placed in

The Thomas Meter housing is located at a convenient point in the gas line

the superintendent's office or other desired location, which may be several hundred feet from the meter. The chart shows him at a glance just how much gas is being used at any time in the steel mill. The complete Thomas meter and recording panels are made and installed by The Cutler-Hammer Manufacturing Co., of Milwaukee, Wis.

Automatic Controller or Rotary Switch

There are many places where an automatic controller may be applied. The accompanying cut shows a special controller constructed by the Reynolds Electric Company of Chicago and New York for a fire alarm siren made by the Federal Sign System (Electric) of Chicago.

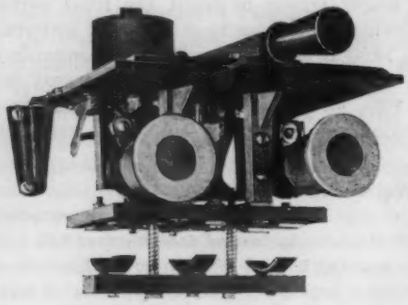
By an ingenious arrangement of contacts, the sounds from the siren are graduated in tones ranging from low to shrill, and by means of suitable gearing the blowing, after continuing for a period of two minutes, is automatically cut off. To start the controller, it is merely necessary to press a push button switch, which closes the circuit and starts the motor driving the controller. Another switch on the controller, as stated before, opens the motor circuit after two minutes operation, thus making practically an automatic device.

The motor is direct geared to the controller to insure a positive drive; the fingers are reinforced at the contact end and are of the "quick break" type and a holder provides for 1-inch take-up in case of wear. The contacts are removable and adjustable. The entire machine, including motor, is rugged and built for hard service.

Similar controllers are now being furnished by the Reynolds Electric Company to the City of Chicago for flashing "Stop" signals, gate lights, and ringing gongs when drawbridge is open and gates are down, giving a positive alarm both by light and sound.

A Starting Switch that Protects the Motor

A motor starting switch should not only start the motor but should also protect it against overload and under-voltage. Various means have been devised to accomplish this dual function, of which one of the smallest and most effective is that illustrated herewith.



Starting Switch

The cut shows that the switch consists essentially of double break wiping contacts, controlled by an electro-magnet, and two inverse time-limit plugs. In case of failure of the current supply, or should the voltage drop approximately 50 per cent below normal, the magnet is de-energized sufficiently to release its armature, thereby operating the trip opening the switch.

The under-voltage release magnet uses a very small amount of energy and is absolutely positive in its action.

The overload protective plugs are of standard manufacture, and designed to operate or open the circuit at approximately 25 per cent beyond the rated full load current of the motor, when properly selected. These plugs are so connected in the circuit that when an overload occurs the fusible element blows, opening the motor circuit and releasing the magnet circuit. In the case of poly-phase motors they are in this way absolutely prevented from operating as single phase, which usually results in disaster to the motor. The fusible elements for these plugs can be replaced at a very small cost.

This switch has been approved by the Industrial Accident Commission of California and the National Board of Fire Underwriters. It is manufactured by the Wells, Morris Manufacturing Company of San Francisco, and designed in single-phase motors of 3 horsepower capacity or less, and poly-phase motors of 5 horsepower or less.

BOOKS AND BULLETINS

Government Publications

In "Methods for Increasing the Recovery from Oil Sands," published by the Department of the Interior, Washington, D. C., are considered the principles involved in increasing recovery and methods of extracting more oil from the oil-bearing formations than by the usual ways of pumping.

"Gas-Mantle Lighting Conditions in Ten Large Cities in the United States" is a recent publication of the Bureau of Standards and sold only by the Superintendent of Documents, Government Printing Office, Washington, D. C.

A new publication of the Bureau of Standards entitled "A Method for Testing Current Transformers" describes a method which will be found useful in commercial plants where delicate laboratory equipment is not available and where large numbers of transformers must be tested rapidly and with moderate accuracy. Two of the most convenient of the possible modifications of the general method are described in detail.

First Annual Report of the United States Tariff Commission submits a statement of the method adopted and all expenses incurred, and a summary of all reports made during the year of 1916-17 of the administration, and the fiscal and industrial effects of the customs laws of this country, including their relation not only to the Federal revenues, but to the industries of the country.

A census of brass, bronze and products for 1914, has been prepared by W. M. Steuart, chief statistician for manufactures, Department of Commerce, Washington, D. C. This bulletin contains a summary and analysis of the industry, with special statistics relating to products.

A publication of the War Trade Board recently issued covers the government rulings to date in regard to exports and imports, enemy trade and transportation, and supplements the enemy trading list.

Mining Bulletins

Bulletin 159 of the Bureau of Mines gives "Abstracts of Current Decisions" on mines and mining, including several which deal with electrical apparatus as used in mines.

"The Mining Industry in the Territory of Alaska," is the subject of Bulletin 153 of the Bureau of Mines, just published. The author is Sumner S. Smith, United States mining inspector.

"Gypsum Products," their preparation and uses are treated in an illustrated publication by R. W. Stone, gotten out by the Bureau of Mines. The work has been prepared with the co-operation of the U. S. Geological Survey.

"Firing Bituminous Coals in Large House Heating Boilers," by S. B. Flagg, is the title of Technical Paper No. 180 of the Bureau of Mines. In the back of the pamphlet is a list of publications on the utilization of coal and lignite.

Miscellaneous

"Dam Sites on the Missouri River in South Dakota" contains many maps and illustrations as well as careful descriptions of construction features. The South Dakota Department of Irrigation has published this bulletin.

"How Does Industrial Valuation Differ from Public Utility Valuation?" is the bulletin form of the paper presented before the American Society of Technical Engineers, New York, by John H. Gray. The author deals with the valuation of franchises, the question of surpluses, losses sustained under public control and cites numerous court decisions and opinions on economics.

"The Straight Road to Financial Independence," by Wm. H. Dodge, embodies concise pointers on sensible investment versus speculation.

Waste in Boiler Rooms

A new publication, "Finding and Stopping Waste in Modern Boiler Rooms," has been gotten out by engineers of the Harrison Safety Boiler Works, Philadelphia. The book is a compilation of recent authoritative information on the design, management, and operation of steam boiler plants. It is divided into five sections, the first of which is about "Fuels." The other four sections include "Combusion," which takes up the chemistry of that process; "Heat Absorption," "Boiler Efficiency and Boiler Testing," "Boiler Plant Proportioning and Management." The book has been compiled by George H. Gibson, Member American Society Mechanical Engineers, assisted by Percy S. Lyon, now Captain of Coast Artillery.

Of Interest to the Trade

The Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., has just issued an eight-page booklet (known as Booklet T), illustrating and describing the Thomas meter for the accurate commercial measurement of gases and air in large quantities. The booklet gives the principle of operation, illustrates essential parts and shows typical installations.

An attractive booklet covering the Electric Space Heater Unit for use in small spaces has recently been given out by the Cutler-Hammer Company.

A circular calling attention to the Hotpoint Maid window display has been sent as a reminder to electrical dealers as well as announcement of the granting of a patent for Hedlite Heaters.

An attractive bulletin describing sales helps for electrical dealers, gotten out by the Robbins & Myers Company of Springfield, Ohio, has recently been given to the trade.

Book Catalogues

Longman, Green & Co., publishers, have issued their catalogue of scientific books for January and February.

D. Van Nostrand Company, 25 Park Place, New York, have just issued their descriptive list entitled "Books of the Year."

A price list of publications gotten out by the McGraw-Hill Book Company, including the titles formerly published by the Clark Book Company, has been issued.

BOOK REVIEW

Hydro-Electric Power Stations

by Eric A. Lof and David B. Rushmore; size 9 x 6 in.; 822 pp.; published by John Wiley & Sons, and for sale by the Technical Book Shop, San Francisco. Price $6.00.

The increased industrial demands of this country, the gradual decrease of our coal resources and present acute coal situation point directly to the fact that our water power must be developed to its fullest extent and large hydro-electric power plants installed as soon as possible. This latest addition to technical deliberation on this subject should receive a hearty welcome from both student and engineer, for the authors have handled the subject ably. They deal quite thoroughly with hydraulics and electricity in their relation to power plants and they have made especial study of the problems which arise in connection with such plants. One of the most useful and practical chapters in the book is that dealing with the economical aspects, which should be invaluable to both students and engineers. The actual cost of a large number of power plants is given at length as well as considerable other information which has not been available hitherto. The authors call their work an educational treatise; it should certainly find a place among the present college text-books.

NEW ELECTRICAL DEVELOPMENTS

(In the Northwest interest centers in the expansion of the various municipal electric interests. The time on bids for the Ruby Canyon contract has been extended by Seattle to March 15th. In the South, application is soon to be made to the government for two million dollars to cover an irrigation project in New Mexico which involves the erection of a large hydro-electric plant at Montoya. The construction of telephone and transmission lines to the new naval base at Riverside is the latest of the war services which have been characteristic of recent events.—The Editor.)

THE PACIFIC NORTHWEST

VANCOUVER, B. C.—Ontario Power Company has appropriated $1,800,000 for additions to its plant.

CHILLIWACK, B. C.—The cost of reconstruction of the telephone lines of the Chilliwack Telephone Company, recently damaged by storms, is estimated at $19,500.

PE ELL, WASH.—The North Coast Power Company of Chehalis, it is reported, is contemplating extending its electric transmission lines from Pe Ell to Meskill.

MORTON, WASH. — Robert Bailey has purchased the Morton Telephone Company. He will make repairs at once and will practically rebuild the system in the spring.

LA GRANDE, WASH.—Plans have been made by the American Nitrogen Products Company for the installation of three electric ovens to provide for increased capacity.

ELLENSBURG, WASH.—Henry C. Mills and others have petitioned the county commissioners for a 50 year franchise to construct and maintain an electric line over certain highways.

SPOKANE, WASH.—Plans and specifications for the Post street ornamental curb lighting system, which is estimated to cost $37,740, were passed by the city council without opposition.

McMINVILLE, ORE.—The installation of the new street lighting system, consisting of 75 series incandescent lamps of 75 candlepower, is nearly completed. P. E. Thornton is superintendent.

TACOMA, WASH. — Ordinance has been introduced authorizing the transfer of $25,000 to the light and water reserve fund for double tracking certain portions of the municipal car line.

CHEHALIS, WASH.—Application of O. E. Anderson and others for a light and power franchise has been refused. The city is being served at the present time by the North Coast Power Company.

BELLINGHAM, WASH. — Farmers' Mutual Telephone Company has voted in favor of issuing bonds in the sum of $20,000 to restore its lines, about 50 per cent of which were destroyed in the recent flood.

BREMERTON, WASH.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until March 4, for the erection of telephone and power transmission lines at the navy yard, Puget Sound.

SEATTLE, WASH.—Contract for furnishing 500,000 incandescent lamps for the lighting department of the city of Seattle has been awarded to the Pacific Lamp & Supply Company, Prefontaine Building, at approximately $100,000.

SEATTLE, WASH.—City is to make another attempt to seal the Cedar River impounding basin. A bill calling for $5000 from the light fund for this purpose has been introduced. Something like $20,000 will be required for the work.

PORT ORCHARD, WASH.—The Puget Sound Pulp & Power Company has petitioned the commissioners of Kitsap county for a franchise to erect and operate electric transmission lines over the highways of the county for a period of 25 years.

MARSHFIELD, ORE.—The C. A. Smith Company is to enlarge its electric plant. Foundation work has been completed for installing electrical equipment. Machinery for a second unit to the extent of $80,000 is on the way from Schenectady.

WENATCHEE, WASH.—The Wenatchee Valley Gas & Electric Company, according to an announcement made by Geo. D. Brown, president, has decided to build a power plant of 1000 horsepower capacity at Chelan Falls. The plant will be in operation by July 1.

BELLINGHAM, WASH.—It was reported some time ago that the Boundary Red Mountain Mining Company's power plant was damaged or destroyed by fire, and the report has just been confirmed. It is estimated that it will take all summer to get a new plant ready for operation.

TACOMA, WASH.—The city council has practically decided on the site near Mineral on which to erect the proposed new unit of the municipal power plant, to cost between $750,000 and $1,000,000. N. L. Taylor, engineer of the light department, has charge of boring test holes to locate bedrock at the site.

TACOMA, WASH. — Northwest Electric Company, 760 Commerce street, has completed the wiring of about 1800 buildings for the government at Camp Lewis, near Tacoma, and is working on the Y. M. C. A. building there, also the Cassidy & McKee building and theater building on the grounds of this camp.

PORTLAND, ORE.—S. C. Jagger of the Morrison Electric Company, and J. H. Sroufe, formerly representative of the NePage-McKenny Company of Seattle, it is reported, have secured a contract for electrical installation in 20 ships under construction for the Republic of France by the Foundation Company of Portland.

SEATTLE, WASH.—Star Machinery Company, operating an extensive plant for rebuilding machinery at 1731 First avenue, South, Seattle, has taken out a permit to erect a $10,000 shop at 207 Horton street, and among other new equipment will install a 15 ton electric crane to run the full length of a 120 foot building.

DAVENPORT, WASH.—The Inter-mountain Power Company has made application to the county commissioners for a franchise to use certain highways in the construction and operation of a two-pole transmission line extending from Long Lake to the Adams line near Odessa. The total length of the line in Lincoln county will be about 70 miles.

TACOMA, WASH.—Superintendent Evans of the light and water department has announced that a permit has been issued for the placing of conduits underground from the Nisqually sub-station at Twenty-third and C streets, to Winthrop avenue. These will be the first underground conduits in Tacoma. The new conduits will be for the shipyards and tideflats.

SPOKANE, WASH.—Spokane, Seattle, and other Northwest cities are to join in a request to Congress for the inclusion of a provision in the new administration water power bill that will permit municipalities to develop water power projects upon government land and give them the right to govern their own publicly owned utilities which secure their supplies of power from such sites.

SEATTLE, WASH.—The city light department has made arrangements with the Stimson Mills Company to supply the department with 1500 kilowatts to assist in providing for the extra demand for power. An additional 600 kilowatts will be obtained from the small hydro-electric plant, which was built to utilize the excess water from the Volunteer Park reservoir, but which was never put to use.

GOLD HILL, ORE. — The Utah Mining Properties, located about 12 miles from Gold Hill, have been acquired by O. C. Runnalls of Seattle, Wash., and associates. The new owners contemplate the erection of an electric transmission line, about 5 miles long, to connect with the lines of the California-Oregon Power Company. It is proposed to equip the mines with electrically operated machinery.

SEATTLE, WASH.—Board of Public Works has changed the date of receiving bids for the Ruby Canyon light and power project on the federal reserve from March 1st to March 15th, at 10 o'clock a. m. This is the project at which the city proposes to produce 33,000 horsepower as the initial unit. Bids will be received at the same time for a completed hydro-electric plant that may fall outside of the federal reserve.

CLE ELUM, WASH.—The council has passed an ordinance granting South Cle Elum a franchise to construct, operate and maintain along, under and across certain streets in Cle Elum, wires, pipe or other forms of conduit for the purpose of conducting electricity, air, gas, water or other form or medium of communicating heat, light and power. Franchise is also granted for erecting wires for the transmission of telephone or telegraph service.

EUGENE, ORE.—A report of the proposed improvements of the power plant at Waterville has been submitted by N. C. Nelson, engineer of the water and light board, which recommends the construction of a wing dam on the McKenzie River to develop 3000 horsepower. The plant now has a generating capacity of 2400 horsepower, and it is recommended that a gate be placed in the forebay to accommodate a second penstock later to supply a third unit. The plant is now built in two units.

PACIFIC CENTRAL DISTRICT

CHICO, CAL.—The contract for the furnishing of electricity to the electrolier system was awarded to the Northern California Power Company.

HANFORD, CAL.—The People's Ditch Company of Hanford, it is reported, is considering the construction of a new electric light and power plant for local service.

RED BLUFF, CAL.—E. A. Rollinson, city engineer of Redding, is compiling data for the city trustees of Red Bluff with a view to establishing a municipal unit of electric lighting for the city.

REDDING, CAL.—The city trustees have instructed the city attorney to draft an ordinance calling for a $40,000 bond election, the money to be used to build or acquire the proposed city lighting system.

LODI, CAL.—Among the improvements contemplated to the municipal electric lighting system are the installation of voltage regulators and additional one-lamp electroliers. John A. Henning is superintendent.

REDDING, CAL. — The electric power plant, planing mill and boiler house of the Shasta Land & Timber Company, of Redding, it is reported, was recently destroyed by fire, causing a loss of about $50,000.

JACKSON, CAL.—Poles are being hauled to the Fortuna Italian Camp mine near Belleview to be used for an electric power line. It is the intention of the company to build a hoist and install a mill this spring.

CALISTOGA, CAL.—The State Railroad Commission has authorized the Calistoga Electric Company to sell its electric distributing system in and about Calistoga to the California Telephone Company of Santa Rosa at $28,900.

YOSEMITE, CAL.—The Treasury Department at Washington has petitioned Congress for authority to use $5000 of the revenues of Yosemite National Park to complete the new hydro-electric power plant in the park.

SAN FRANCISCO, CAL.—A dividend of $1.50 per share on the preferred stock of the San Joaquin Light & Power Company was declared February 14th to stockholders of record February 28, 1918, payable March 15, 1918.

SAN FRANCISCO, CAL. — The Asher Electrical Company, 607 Howard street, San Francisco, has been awarded the contract for the installation of a street lighting system and the interior wiring of the barracks buildings at the camp at Angel Island.

RICHMOND, CAL.—The Pacific Telephone & Telegraph Company has informed the Merchants' Association that they will co-operate with them for the beautifying of MacDonald avenue by removing all poles from the street, if it is decided to install electroliers.

FRESNO, CAL.—A petition of the residents of South Van Ness avenue for a permit to erect electroliers from Kern street to California, has been referred to the committee and Electrician T. M. Robinson has been asked to get figures on the cost of concrete and castiron posts.

ALPAUGH, CAL.—The new substation of the San Joaquin Light & Power Company, which is to supply electricity to operate the pumps for irrigating 8000 acres in the Alpaugh irrigation district, has been completed. The substation is equipped with three 500 kilowatt transformers and is supplied with electricity from the Corcoran generating station.

COLUSA, CAL.—Eight dredgers are on their way to Colusa to undertake an irrigation project which is to water 10,000 acres of rice land, located four and a half miles west of Colusa on both sides of the highway. The ditches are to be ready for operation by April 15. Rights of way have been purchased from the Tuttle Land Company of this city, and the completion of the project will involve the expenditure of $250,000 and will give employment to 300 men.

SAN FRANCISCO, CAL.—The extension of the Municipal Railroad into the Sunset District and condemnation of a strip of land 300 feet wide from Market and including Capp street to the county line as a means of giving municipal car service through the Mission District, is a plan which City Engineer M. M. O'Shaughnessy has advocated in an address before the city planning section of the Commonwealth Club. Mr. O'Shaughnessy outlined transportation problems in San Francisco.

SAN FRANCISCO, CAL.—Work has begun on the construction of the shipbuilding plant of the Pacific Coast Shipbuilding Company at Bay Point. The buildings will include a plate shed, 80 feet by 400 feet, two stories; machine shop, 120 feet by 400 feet, one story; a large warehouse, power house, an office building, planing mill, etc. The launching ways will be 500 feet long, 53 feet wide, with 95 feet clearance between. Aerial trolleys will be used for the transportation of supplies. The cost of the plant is estimated at $500,000.

STOCKTON, CAL.—The voters of the West Side Irrigation District, centering at Tracy, a few days ago voted on an issue of $100,000 bonds needed to complete the system. The original bond issue was found inadequate, owing to increasing construction costs. The second issue, with the sum already authorized, will increase the indebtedness of the district to $34 per acre. The system is rapidly nearing completion and will be ready for use this summer. Water will be pumped from Old River and carried to higher levels by a system of canals and big electric pumps.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—Sealed bids are being received by the Board of Supervisors for installing an addition to the ornamental street lighting system.

FULLERTON, CAL.—Necessary funds are to be raised by subscription for the installation of street lights here. As a beginning, nine lights will be installed on the principal corners.

ESCONDIDO, CAL.—Ranchers of San Pasqual Valley are taking up the matter of irrigation plants with much interest. San Pasqual will soon be irrigated in a modern way, with wells and electrically driven pumps.

LOS ANGELES, CAL.—The plan to have the Pacific Electric Railroad place its tracks closer together on the trolley way through Venice to Ocean avenue, Santa Monica, is again being agitated by city officers of both cities.

LOS ANGELES, CAL.—At the request of the government, and as a special war measure, the Pacific Electric, it has been announced, will immediately double-track its line between Long Beach and the harbor. The construction job will cost at least $200,000.

DOUGLAS, ARIZ.—Permanent organizaton of the Agua Prieta Light & Water Company is to be perfected at a meeting to be held at that place. It is planned to organize a $30,000 corporation and build an electric light and water plant to supply the border Mexican city.

PALMDALE, CAL.—Preliminary stages of the formation of the Palmdale Irrigation District have met with success. The dam will be located three miles above the present headgates of the water company, and will be built along multiple arch lines, the cost being estimated at $300,000.

SAN BERNARDINO, CAL. — A project to convert the Antil steam pumping plant into an electrical plant is under consideration by the water department. Figures compiled by the commission indicate that the Antil plant could be operated considerably cheaper by electricity than by steam.

LOS ANGELES, CAL. — The Southern Sierras Power Company has joined with the Corona Gas & Electric Light Company, the Bishop Light & Power Company, the Rialto Light, Power & Water Company, and the Coachella Valley Ice & Electric Company, in seeking authority for the last-named four concerns to sell their properties to the Southern Sierras corporation.

REDLANDS, CAL.—Dike & Logie have announced that a contract for a first pump for the water system that will place water on all the Dunlap ranch tract and that part clear to Sunset Boulevard, has been let to Jackson-Church Pump Company of Los Angeles. The water system, which will supply that section of Yucaipa Valley now being thrown open, will cost in the neighborhood of $150,000.

ROSWELL, N. M.—The Roswell Gas & Electric Company is installing two 256 horsepower Erie vertical boilers with Erie stokers, two boiler-feed pumps, with heaters and all auxiliaries, a 1200 square foot surface condenser on Allis-Chalmers engine, erecting a steel stack, 150 feet high, 6 feet in diameter, and also moving and raising three 200 horsepower Babcock & Wilcox boilers for stokers. C. M. Einhart is secretary.

PASADENA, CAL.—Maps are being prepared and complete data printed by the city describing in full the proposed rapid transit right of way between this city and Los Angeles, for which a bond election will be held April 20th. According to tentative plans, the total bond issue will be for $700,000, if the terminals are provided for in the cost. The Los Angeles terminal, at the corner of First and Hill streets, will cost $49,500, and the Pasadena terminal, $115,676.

RIVERSIDE, CAL.—It is estimated that more than $1,000,000 will be spent in building and equipping the new aviation base here. A mile and a quarter branch line will be constructed by the Santa Fe Railroad. The Southern States Power Company will extend its line to provide electric power; seven main trunk telephone lines will be installed by the Pacific Telephone Company, and the Western Union and Postal Companies will install offices.

RIVERSIDE, CAL. — Southern Sierras Power Company has made a proposition to the Board of Supervisors to light the road on Box Springs grade and in the Perris Valley to Allexandra, providing the aviation base is located in the latter place. The company offers, if a five year contract is entered into, to furnish equipment for the service without any charge to the city for equipment, and to furnish light at the usual rates. If the contract is made for a year, the county is asked to pay for the installation, with the amount refunded in power by the company.

LAS CRUCES, N. M.—Formal application will soon be made to the United States government for the advancement of $2,000,000 to be used in the construction of an irrigation canal that is to lead from the diversion dam of the Elephant Butte reclamation project at Leasburg to Montoya, and for the installation at the latter place of a large hydro-electric plant. All money required for the proposed work is to be repaid by the project. The proposed hydro-electric plant is to provide power for operating industries and to supply energy in El Paso, Las Cruces and other towns along the transmission line.

THE INTER-MOUNTAIN DISTRICT

BILLINGS, MONT.—Clerk has been authorized by council to call for bids for installing street lights in Special Lighting District No. 3.

CHOTEAU, MONT.—H. and Alice E. McCullough et al. have formed the McCullough Electrical Company, with a capital stock of $20,000.

HAMILTON, MONT.—The Missoula, Mont., Light & Water Company has offered to sell its water works system in Hamilton to the city for $75,000.

MALTO, MONT.—Arrangements are being made for the installation of a new generator in the local electric light plant, which has already been purchased.

BURLEY, IDAHO—The farmers adjacent to Burley on the southwest are talking strongly of installing electric light and power by getting the line extended from Burley.

EUREKA, NEV.—Handley Brothers, it is reported, have decided to erect a power sheep-shearing plant (to cost about $3000) at the Charley Minoletti ranch, about nine miles north of Eureka.

ABSAROKEE, MONT.—The hydro-electric power plant of the Absarokee Power Company will be completed and placed in operation in about a month. Edward R. Reber is manager.

CONRAD, MONT.—Frank Seal, manager of the Electric Equipment Company, of Great Falls, will install Conrad's new lighting system. C. P. Wells, consulting engineer of Great Falls, has charge of the work.

BRIDGER, MONT.—The Bridger Water & Light Company contemplates changing its system from direct to alternating current, provided equipment can be secured. J. S. Emmett is secretary and treasurer.

STRAWBERRY VALLEY, UTAH—Some repair work is being done on the water wheels at the power plant on the Spanish Fork River and petitions have been received from a number of districts desiring power.

LAMOILLE, NEV.—The Elko-Lamoille Power Company is contemplating improvements to its local system. The proposed work includes the construction of a new reservoir and piping the waters of the west fork of the stream into it with a pipe line 5000 feet long.

KENDRICK, IDAHO—The Potlach Consolidated Electric Company has placed orders for copper wire to replace the iron wire for the electric transmission line between Kendrick and Troy. The company is now installing three new transformers at its Troy station. A. Wilmot is president.

GOLD HILL, UTAH—Frank W. Ferris of Gold Hill, it is reported, is building a power plant on Trout Creek, about 48 miles from Gold Hill, to cost between $40,000 and $50,000. Electricity generated at the plant will be used at the mines in the Gold Hill, Clifton, Willow Springs, Fish Springs, Ferber and other mining districts.

MINIDOKA, IDAHO — The United States Reclamation Service reports that work on the transmission line to Melcher mine was continued. Considerable delay and some damage was caused by storms on the summit of the mountain which the line crosses. Fair progress was made on the substation at the mine. There was no interruption to service at the power house during the month.